

BULLETIN

of the

American Association of Petroleum Geologists

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Seismograph Surveys



BULLETIN
of the
**AMERICAN ASSOCIATION OF
PETROLEUM GEOLOGISTS**

JUNE, 1945

EXPLORATORY DRILLING IN 1944¹

FREDERIC H. LAHEE²

Dallas, Texas

ABSTRACT

In this review of exploratory drilling in 1944 we have used the standardized classification which was fully explained in last year's review, printed in this *Bulletin* in June, 1944. Further diagrammatic explanations are given this year.

In 1944, 4796 exploratory holes were drilled as contrasted with 3843 in 1943. The total exploratory footage in 1944 was 20,225,887 feet as against 15,122,364 feet in 1943. The average depth of hole increased from 3935 feet in 1943 to 4217 feet in 1944, for the United States as a whole, and from 4968 feet to 5317 feet in the southern-states area. Again we have compiled figures on the relations of exploratory drilling to estimated proved reserves in the eleven states of Arkansas, California, Illinois, Indiana, Kansas, Louisiana, Michigan, Mississippi, New Mexico, Oklahoma, and Texas. We wish especially to caution readers and those who use or quote the figures herein presented to be careful to note whether these figures refer to the entire United States, or to the southern-states area (southeastern New Mexico, Texas, Arkansas, Louisiana, Mississippi, Alabama, Georgia, and Florida), or to the eleven-states area.

During 1944 the great increase in the exploratory effort apparently bore fruit in an upward trend in estimated proved reserves, not only for the eleven-states area, but also for the entire country. We want to stress this point, however, that this temporary upward trend should not lead to a reduction in the search for *new fields*.

In our review of exploratory drilling in 1943,³ we presented a classification of exploratory holes, drilled for petroleum, and we pointed out that this classification (Table I) had been accepted for nation-wide use by the Petroleum Administration for War and by the Petroleum Industry War Council. The statistics on 1943 drilling were tabulated on the basis of this classification. In the pages that follow we have again used this same classification and every effort has been made by the writer to see that those who, in different parts of the country, have contributed data on their districts, grouped their statistics on analogous lines. This is relatively easy in some regions, but in others there are inherent difficulties in discriminating between certain types of exploratory hole, so that certain arbitrary limitations had to be adopted. On the whole, however, we believe that the figures presented for 1944 exploratory drilling are essentially consistent and are analogous to those published in our reviews of recent years.

¹ Manuscript received, April 19, 1945.

² Chief geologist, Sun Oil Company.

³ "Classification of Exploratory Drilling and Statistics for 1943," this *Bulletin*, Vol. 28, No. 6 (June, 1944), pp. 701-21.

For the 1944 statistics, as in the past, the writer has been assisted through the kind cooperation of many friends,⁴ but we have never had an organized committee. Believing that this annual study is a valuable measure of the exploratory effort in which all members of the American Association of Petroleum Geologists are vitally interested, and believing that no organization could more efficiently and more appropriately carry on this work from year to year than this Association, we recommended that a standing committee be authorized and organized

TABLE I
CLASSIFICATION OF EXPLORATORY WELLS

	CLASSIFICATION WHEN DRILLING IS STARTED		CLASSIFICATION AFTER COMPLETION OR ABANDONMENT	
			SUCCESSFUL	UNSUCCESSFUL
	A		B	C
DRILLING FOR LONG-TERM PRODUCTION IN AN ENVIRONMENT ALREADY DEVELOPED.	1 OUTPOST		1 EXTENSION WELL (SOMETIMES A NEW-POOL DISCOVERY WELL)	1 DRY OUTPOST WELL
DRILLING FOR A NEW POOL ON A STRUCTURE OR IN A GEOLOGICAL ENVIRONMENT ALREADY PRODUCTIVE.	2a SHALLOWER-POOL TEST		2a SHALLOWER-POOL DISCOVERY WELL	2a DRY SHALLOWER-POOL TEST
	2b DEEPER-POOL TEST		2b DEEPER-POOL DISCOVERY WELL	2b DRY DEEPER-POOL TEST
	2c NEW-POOL WILDCAT		2c NEW-POOL DISCOVERY WILDCAT	2c DRY NEW-POOL WILDCAT
DRILLING FOR A NEW FIELD IN AN ENVIRONMENT NEVER BEFORE PRODUCTIVE.	3 NEW-FIELD WILDCAT		3 NEW-FIELD DISCOVERY WILDCAT	3 DRY NEW-FIELD WILDCAT

under the auspices of the Association, the committee to be known as the Committee on Statistics of Exploratory Drilling. We are pleased to announce that this new committee received the approval of the Association at the annual business meeting of March, 1945. When this committee has been duly appointed and instructed, there should be further improvement in standardizing the factors for classifying exploratory wells and, accordingly, the data from widely separated districts should attain a greater degree of uniformity than hitherto. In other

⁴ To these gentlemen the writer is glad to express his thanks and appreciation for supplying him with the statistics used in the preparation of this article: A. P. Allison, A. H. Bell, J. E. Billingsley, Kendall E. Born, D. H. Cardwell, M. G. Cheney, Virgil B. Cole, Kenneth Cottingham, R. J. Cullen, B. W. Dawson, George Donaldson, Ralph Esarey, F. H. Finn, Darsie A. Green, George Grow, J. M. Hansell, D. C. Harrell, W. Lloyd Haseltine, M. D. Hubley, S. N. Jackson, E. A. Koester, C. S. Lavington, Lynn K. Lee, G. D. Lindberg, A. M. Lloyd, R. G. Maxwell, W. S. McCabe, J. G. Montgomery, Graham B. Moody, D. J. Munroe, H. S. Owen, J. Jack Parker, Tom F. Petty, C. H. Row, J. J. Schmidt, Glenn C. Sleight, J. B. Sparks, R. B. Totten, Paul Weaver, E. B. Wilson.

words, the personal equation should be considerably reduced as a factor of uncertainty.

Requests have frequently been made for diagrammatic illustrations of the several types of hole used in our classification. We have attempted to cover a variety of cases in Figure 1, in which is shown a series of vertical sections, drawn during several stages of development of a newly discovered field. In all the sections short-dash lines are used to indicate drilling wells; full lines are used to indicate completed producers; and long-dash lines are used to indicate abandoned dry holes or, in some cases, the lower non-producing parts of deep wells.

In Section A is shown a *new-field wildcat*, which we shall call hole 1, being drilled on a structure which has never produced before. It happens to be the first hole drilled on this structure.

In Section B is shown a second well which was started before No. 1 discovered any pay. Therefore, No. 2 is just as much a new-field wildcat as is No. 1. Both are equivalent as to the degree of exploratory effort.

In Section C, No. 1 has been completed as the discovery well of a new pool and, at the same time, as the discovery well of a new field. It is therefore classed as a *new-field wildcat discovery*. It was drilled to a considerable depth below the reservoir sand, *s*, in which it was eventually completed. To its total depth, however, it was exploring for oil or gas and therefore its total depth is to be rated as *exploratory footage*. The distance from the surface of the ground to the pay sand, *s*, is not the full "exploratory footage" but is discovery footage. Meanwhile, well No. 2 has been drilled deeper than in Section B, but has not yet reached the producing sand, and No. 3 has been started after completion of No. 1 in the newly discovered reservoir sand. Therefore, No. 3, being distant only one or two locations from No. 1, is a *field well*, or, as some call it, a *field-development well*.

In Section D well No. 2 has been completed as an oil well in the reservoir sand at a somewhat greater subsea depth than in well No. 1. Well No. 3, the field well, is still in process of drilling. Well No. 4, several locations from No. 2, has been started as an *outpost well* with the object of looking for the same pay sand as that which produces in Nos. 1 and 2.

In Section E well No. 3 has been completed in the reservoir sand updip from No. 1. Wells No. 2 and No. 3 were carried only through the pay sand since, in drilling No. 1, no other pay sands were found down to the total depth of No. 1. Well No. 4 has also been completed in this same reservoir sand considerably farther downdip than No. 2. It was carried a short distance below this pay sand before being completed in it. Wells No. 5 and No. 6 have been started as *outpost wells*, one on one side of the field and the other on the other side. Meanwhile, drilling has demonstrated that there is a definite unconformity, *ab*, not quite half way down from the surface to the producing sand.

In Section F, well No. 5 is still drilling; and well No. 6 has been completed in what turns out to be the same pay sand as that found in wells Nos. 1, 2, 3 and 4, but at a considerably greater subsea depth than it was encountered in No. 3, the

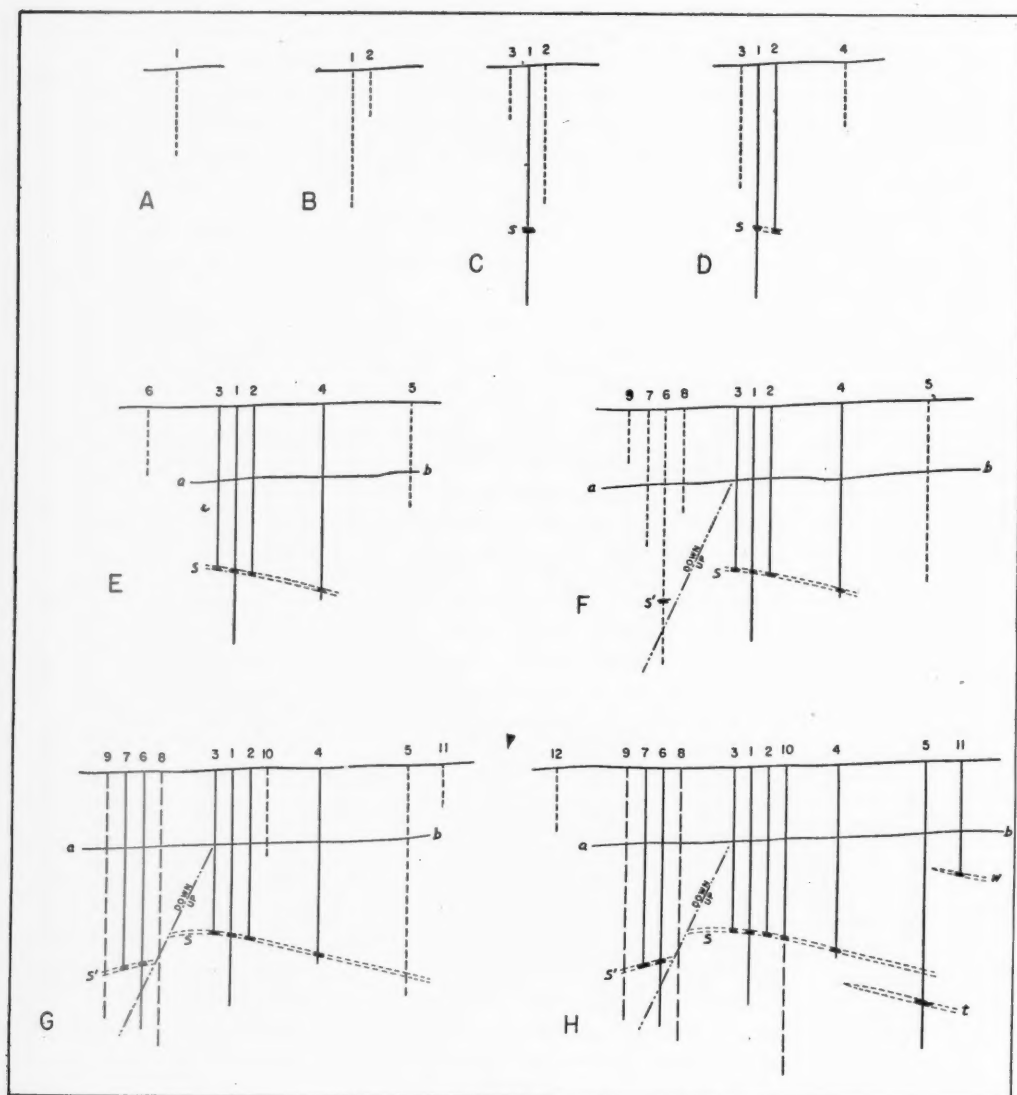


FIG. 1

nearest producing well. Due to the general subsurface conditions it is inferred that there is a fault between wells 3 and 6, but extending up only as far as the unconformity *ab*. This fault did not cut the section below the unconformity in well 3, but it did cut out a considerable stratigraphic section below the pay sand, *s'*, in well 6, as is determinable by a comparison of this lower section with the lower section penetrated below reservoir sand *s*, in well 1. The presumption is that reservoir *s'* is a separate pool from reservoir *s*, since it is so much deeper. Therefore, well 6 is the discovery well of a *new pool* on the same structure that was first found to produce by well No. 1. This structure now has two *pools* opened on it, both of them parts of one *field*.

Further, in Section F, wells 7, 8 and 9 have been started, all of them after completion of well No. 6. Consequently wells 7 and 8 are field-development wells, and well 9 might be called either a rather distant field-development well or an outpost well, according to the degree of complexity of structures in the region.

In Section G well 7 has been completed in pool *s'*; well 8 has been abandoned as a dry hole since it passed through the gap of the fault and entirely missed the pay; well 9 has been abandoned as a dry hole since it was too far downdip and found water in reservoir *s'*; well 10 has been started and has already been drilled somewhat below the unconformity, *ab*; and well 11 has also been started, but before it was known that well 5 would find water in sand *s*. Under these circumstances well 11 might have been considered an *outpost*, similar to well 5. However, if well 5 had been drilled through sand *s*, which was shown to be non-productive, before No. 11 was spudded in, well 11 would then have been called a *new-pool wildcat*. Well 5 is to be carried deeper than sand *s*, and the operator decided to continue drilling well 11 after sand *s* was found to be dry in well 5.

In Section H well 10 was started as a *deeper-pool test* to look for new sands below sand *s*. Since no other prospective sands were found below the known pool, this hole was plugged back and completed in sand *s*. Therefore, its footage below sand *s* was exploratory, and it should be listed as an exploratory hole and assigned this amount of footage, although it was completed as a field well in the known pay. In the continued drilling of well 5, a new sand, *t*, was penetrated, and this well was completed in this sand. As shown in the diagram, this must lense out updip before reaching well 10. It might be present under well 4, which was not drilled deep enough to reach it. Sand *t* is therefore the third pool discovered in this field and on this structure. Meanwhile well 11 picked up a gas sand at a relatively shallow depth, but still in the formations below the unconformity, a sand which was not found in well 5. We are calling this sand *w*. It is evidently another lens which pinches out before reaching well 5. It is the fourth pool discovered on this structure and in this field, and since it has gas in it, in well 11, there is the probability that further drilling in a downdip direction will find oil in the same sand.

Summarizing, with reference to the several sections shown in Figure 1, well 1 is a new-field discovery well, located as a new-field wildcat; well 2 is a producing field

well, located as a new-field wildcat; well 3 is a producing field well, located as a field well; well 4 is an extension well, located as an outpost; well 5 is a new-pool discovery, located as an outpost; well 6 is a new-pool discovery, located as an outpost; well 7 is a producing field well, located as a field well; well 8 is a dry field well, located as a field well; well 9 is a dry field well, located as a field well; well 10 is a dry deeper-pool test as far as its footage below reservoir sand *s* is concerned, and it has been completed as a field well; and well 11 is a new-pool discovery well, located as a new-pool wildcat (provided it was started after *s* passed through sand *s*), or as an outpost (provided it was started before well 5 passed through sand *s*).

Except where otherwise designated, the statistics recorded in this paper are similar to those used in our reports for 1939 to 1943 inclusive. We include wildcats (both new-field wildcats and new-pool wildcats), outpost wells, deeper-pool tests and shallower-pool tests. For all but the deeper-pool tests we use, as exploratory footage, the total footage drilled in each hole, whether a producer or a dry hole, but in the case of the deeper-pool tests we include only the footage drilled below the deepest producing formation penetrated by the well. These 1944 figures may be consistently compared with those published in our reports of 1939 to 1943.⁶

On the maps (Figs. 2 and 3), numbers in parentheses indicate total footage drilled; figures preceding parentheses indicate the number of holes drilled; figures above the cross line are for producing wells, that is, oil, oil and gas, condensate (distillate) and gas, and gas; and figures below the cross line are for dry holes.

In the states covered in this review, as shown in Figure 2, and listed in Table II, during 1944 a total of 20,225,887 feet was drilled in 4796 exploratory holes, divided as follows.

	Feet
944 producers.....	4,382,220
3,852 dry holes.....	15,843,667

This means that 19.6 per cent of the holes drilled, and 21.1 per cent of the footage drilled were successful in 1944. One producer foot was drilled for every 3.61 feet of dry hole. One successful well was drilled for every 4.08 dry holes. The average depth of hole was 4217 feet.

In the southern states district (Fig. 3), in 1944, a total of 11,899,426 feet was drilled in 2,238 holes, divided as follows.

	Feet
473 producers.....	2,804,005
1,765 dry holes.....	9,095,421

In this area, then, 21.1 per cent of the holes drilled, and 23.5 per cent of the footage drilled were successful. One producer foot was drilled for every 3.24 feet of dry hole. One successful well was drilled for every 3.73 dry holes. The average

⁶ *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 24, pp. 953-58; Vol. 25, pp. 997-1003, 1938, 1939; Vol. 26, pp. 969-82; Vol. 27, pp. 715-29; and Vol. 28, pp. 701-21.

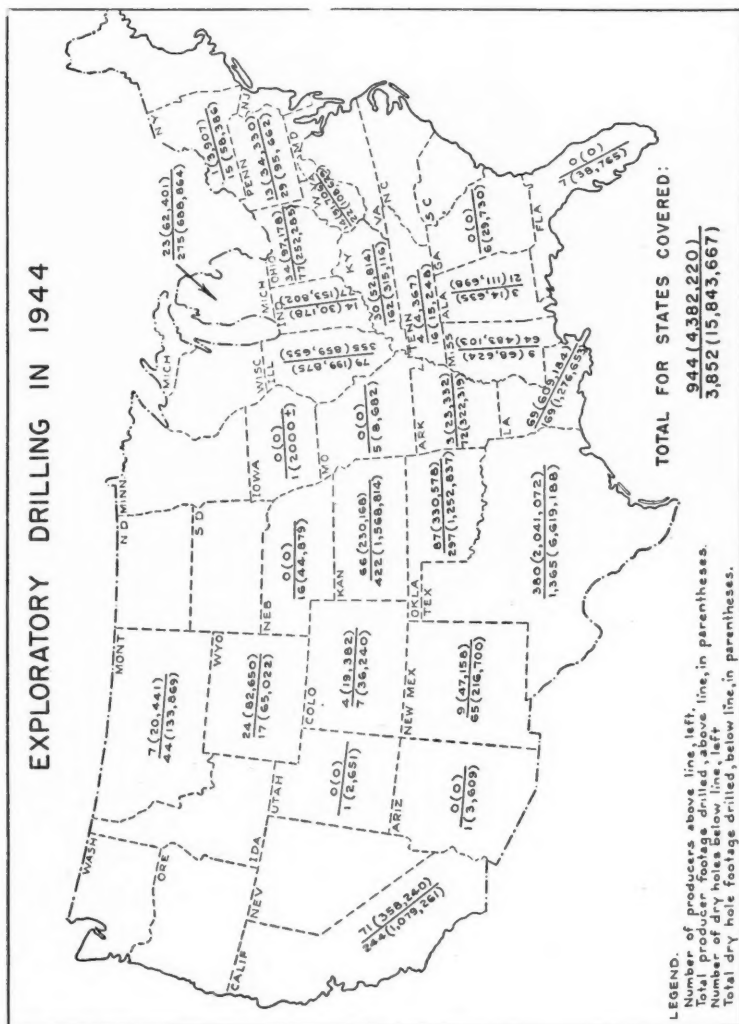


FIG. 2

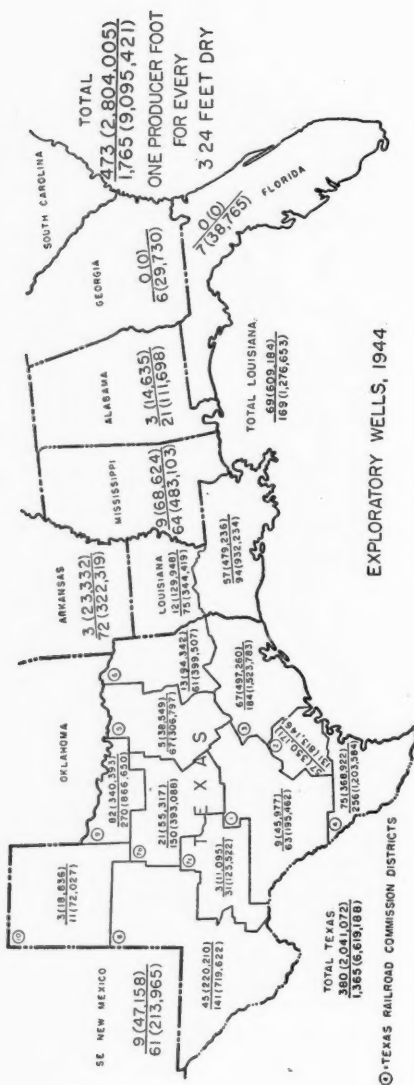


FIG. 3

TABLE II
NUMBER OF OIL WELLS, GAS WELLS, CONDENSATE WELLS, AND DRY HOLES DRILLED AS EXPLORATORY TESTS IN 1944

States	Oil Producers		Gas Producers		Condensate Producers*		Dry		Total Number of Holes	Total Footage Drilled	Average Depth of Hole
	Number of Holes	Footage Drilled	Number of Holes	Footage Drilled	Number of Holes	Footage Drilled	Number of Holes	Footage Drilled			
Alabama	3	14,635	0	0	0	0	21	111,608	24	126,333	
Arizona	0	0	0	0	0	0	1	3,600	1	3,600	
Arkansas	2	16,241	0	0	1	7,091	72	322,310	75	345,651	4,600
California	58	283,201	13	74,049	0	0	244	1,070,261	315	1,437,501	4,563
Colorado	3	12,377	1	7,005	0	0	7	36,240	11	55,022	
Florida	0	0	0	0	0	0	0	36,705	7	36,705	
Georgia	0	0	0	0	0	0	6	28,165	6	28,165	
Illinois	70	100,875	0	0	0	0	355	850,855	434	1,050,130	2,441
Indiana	14	30,178	0	0	0	0	77	153,802	91	183,080	2,022
Iowa	0	0	0	0	0	0	1	2,000?	1	2,000	
Kansas	54	181,578	0	48,590	0	0	422	1,568,814	488	1,798,982	3,686
Kentucky (W)	29	32,147	1	32,667	0	0	102	315,110	102	397,930	1,916
Louisiana	4	343,344	1	32,057	21	232,885	199	1,658,053	238	1,885,837	7,924
Michigan	20	6,344	4	6,344	1	0	25	13,824	28	15,168	1,848
Mississippi	7	56,330	1	2,138	1	9,907	64	483,193	73	531,727	7,358
Missouri	0	0	0	0	0	0	5	86,682	5	86,682	
Montana	4	13,365	3	7,076	0	0	44	133,860	51	154,310	3,026
Nebraska	0	0	0	0	0	0	10	44,879	16	44,879	
New Mexico	8	37,566	0	9,592	0	0	65	210,700	74	293,858	3,566
New York	0	0	1	3,907	0	0	15	56,382	16	62,293	
Ohio	10	23,268	21	17,925	0	0	17	389,448	114	389,448	3,138
Oklahoma	71	278,712	16	51,866	0	0	297	1,252,817	384	1,531,415	3,143
Pennsylvania	1	2,085	12	32,245	0	0	20	95,662	42	120,902	3,093
Tennessee	1	522	3	3,845	0	0	16	15,248	20	16,615	
Texas	270	1,382,275	38	184,858	63	473,939	1,305	6,619,188	1,745	8,060,260	4,963
Utah	0	0	0	51,766	0	0	1	2,651	1	2,651	
Virginia	0	0	0	7,552	0	0	22	108,039	36	106,335	4,454
West Virginia	22	75,008	14	7,552	0	0	17	65,022	41	147,672	3,602
Wyoming	0	0	0	0	0	0	0	0	0	0	
Totals	700	3,058,318	140	60,020	86	723,882	3,852	15,843,667	4,796	20,235,887	4,217

* In former years our statistics have included condensate wells with gas wells.

† Averages have been recorded here only for states where more than 25 exploratory holes were drilled in 1944.

depth of hole was 5317 feet. For comparison with statistics for this same area in 1938, 1939, 1940, 1941, 1942, and 1943, see Table III.

Selection of the location for a wildcat well may be based on geology (surface geology, subsurface geology, trend along known structural or stratigraphic conditions, local or regional, or shallow exploratory drilling); or it may be based on geophysics (exploration by seismograph, torsion balance, gravity meter, magnetometer, *et cetera*); or it may be based on some non-technical suggestion or requirement, such as "creekology," "hunch," "doodlebug," promotion, lease obligation, reported showing of oil or gas in holes previously drilled, *et cetera*. In some cases the reason for choosing the location can not be ascertained.

In Table IV are listed the reasons for drilling the exploratory holes in 1944, using the best information available from men familiar with such statistics, each in his own state or district. According to these figures, 844 exploratory holes drilled on technical advice (geology and/or geophysics) were successful (oil or gas), and 3007 were dry; 90 holes, located for non-technical reasons, were producers, and 735 were dry. Ten producers and 110 dry holes were located for reasons unknown. These figures show that 21.9 per cent of the holes drilled on technical advice were producers as contrasted with 10.9 per cent successful in the case of the holes located without technical advice. Therefore, in 1944, locations based on technical recommendations were twice as successful as those drilled without such advice. In the southern states area (Fig. 3) 8.2 per cent of the exploratory holes, located without technical advice, were producers, whereas 22.5 per cent of the holes located on technical advice were producers.

Comparing last year's figures⁶ with figures for 1944, we note the following.

1. There was a considerable increase in the exploratory effort in all important states.
2. The average depth of hole, in the states where 25 or more exploratory holes were drilled, decreased in Arkansas, Kansas, Kentucky, and Louisiana, but increased in all other states included in this category. The over-all average depth for the United States increased from 3935 feet to 4217 feet.

As in the past 2 years we are again submitting herewith special tables relating to the following eleven states: Arkansas, California, Illinois, Indiana, Kansas, Louisiana, Michigan, Mississippi, New Mexico, Oklahoma, and Texas. In Table V are shown statistics on the exploratory holes, and in Table VI statistics on the proved reserves, in the area of these same eleven states.

In Table VI, under A, are recorded the proved reserves as of January 1 in each of the indicated years, and for the eleven-states area under discussion. Under B is shown, for each January 1, the net change in estimated proved reserves since the preceding January 1, allowing for production during that 12-month period. Under C are the new proved reserves which are directly attributable to new-pool

⁶ F. H. Lahee, "Classification of Exploratory Drilling and Statistics for 1943," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 28, pp. 701-21.

TABLE III
COMPARATIVE STATISTICS FOR ALL STATES SHOWN IN FIGURE 3*

Year	Producers Drilled				Dry Holes Drilled				Total Number Explor. Holes Drilled	Total Feet Explor. Drilled	Average Depth of Explor. (Feet)	Number of Dry-Hole Feet Drilled for Each Producer Foot
	Holes		Footage		Holes		Footage					
	Number	Per Cent	Feet	Per Cent	Number	Per Cent	Feet	Per Cent				
1938	200	13.6	984,262	17.4	1,271	86.4	4,667,402	82.6	1,471	5,651,664	3,842	4.74
1939	101	12.6	779,345	14.3	1,113	87.4	4,501,060	85.2	1,174	5,281,014	4,145	5.00
1940	101	12.6	779,345	14.3	1,113	87.4	4,501,060	85.2	1,174	5,281,014	4,145	5.00
1941	258	16.5	1,259,524	18.9	1,259	83.5	5,473,713	83.6	1,469	6,736,770	4,500	5.71
1942	231	16.3	1,280,480	19.6	1,186	83.7	5,205,556	80.4	1,417	6,485,036	4,647	4.11
1943	287	17.3	1,546,956	18.8	1,369	82.7	6,680,512	81.2	1,656	8,227,468	4,968	4.32
1944	473	21.1	2,804,005	23.5	1,765	78.9	9,095,421	76.5	2,238	11,899,426	5,317	3.24

* In this table New Mexico data are from the southeastern part of the state only.

1 See *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 25, p. 1938, where corrections are mentioned for these figures as they appeared in Table II, p. 1001, of the same volume.

TABLE V
STATISTICS ON EXPLORATORY HOLES IN AREA OF ELEVEN SELECTED STATES*

	Located on Technical Basis						Non-Technical Location						Unknown Basis for Location						Totals				Grand Totals		Grand Footeage	Number of Ft. in Dry Holes in Drilled Producing Exploratory Holes
	Producers			Dry Holes			Producers			Dry Holes			Producers			Dry Holes			Producers		Dry					
	Num-ber	Per Cent	Num-ber	Per Cent	Num-ber	Per Cent	Num-ber	Per Cent	Num-ber	Per Cent	Num-ber	Per Cent	Num-ber	Per Cent	Num-ber	Per Cent	Num-ber	Per Cent	Producers	Per Cent	Footeage	Producers	Per Cent			
1937	214	16.05	1,119	83.95	17	5.80	276	64.20	48	9.21	473	90.79	279	12.90	1,868	87.01	2,447	1,482,869	1,188,366	7,002,875	5.89					
1938	283	17.93	1,495	86.07	43	6.01	322	62.30	17	4.97	347	95.33	343	13.08	2,164	86.32	2,597	1,602,750	1,452,869	7,119,807	4.80					
1939	300	18.60	1,660	84.31	35	6.01	322	62.30	17	4.97	347	95.33	343	13.08	2,164	86.32	2,597	1,602,750	1,452,869	7,119,807	4.80					
1940	390	15.69	1,666	86.97	35	4.15	616	63.85	11	8.00	125	100.00	355	12.37	2,516	87.63	2,871	1,937,395	1,707,424	8,346,424	6.03					
1941	463	20.17	1,832	70.83	29	3.92	710	96.08	0	0	55	100.00	492	15.92	2,023,184	84.08	3,080	2,023,184	1,832,184	9,222,217	4.55					
1942	438	18.25	1,901	81.75	21	3.81	530	66.19	11	12.36	78	87.64	470	17.22	2,597	87.83	3,930	2,004,038	1,832,184	9,597,767	4.58					
1943	584	20.23	2,457	80.77	19	4.41	411	95.59	6	9.23	59	90.77	609	17.22	2,297	82.78	3,530	2,623,207	1,655,176	11,681,366	4.42					
1944	761	21.44	2,479	78.56	46	7.44	574	92.56	3	5.45	52	94.55	810	19.21	3,465	86.79	4,215	4,000,810	14,521,496	18,522,306	3.62					

* This area includes California, New Mexico, Texas, Oklahoma, Kansas, Arkansas, Louisiana, Mississippi, Illinois, Indiana, and Michigan.

TABLE IV
BASIS FOR LOCATING EXPLORATORY HOLES DRILLED IN 1944

State	Geology		Geophysics*		Geology and Geophysics*		Sundry Non-Technical		Unknown		Totals		Grand Total
	Prod.	Dry	Prod.	Dry	Prod.	Dry	Prod.	Dry	Prod.	Dry	Prod.	Dry	
Alabama	2	4	0	0	1	4	0	1	0	0	3	31	24
Arizona	0	1	0	0	1	0	0	0	0	0	0	1	1
Arkansas	0	29	2	35	1	5	0	2	0	0	3	72	75
California	49	159	5	37	16	37	1	8	0	0	71	244	315
Colorado	3	3	1	2	0	0	0	2	0	0	4	7	11
Florida	0	1	0	0	0	0	0	4	0	0	0	7	7
Georgia	0	0	0	0	0	0	0	0	0	0	0	0	0
Illinois	54	216	15	51	5	16	5	52	0	0	70	355	434
Indiana	12	17	1	20	0	0	0	35	1	0	14	27	101
Iowa	0	1	0	0	0	0	0	0	0	0	0	1	1
Kansas	44	196	8	50	2	10	12	150	0	0	66	422	488
Kentucky (W)	20	84	0	0	0	0	10	77	0	0	30	162	182
Louisiana	32	64	18	65	19	38	6	2	0	0	69	169	201
Madison	12	12	1	2	0	0	0	14	0	0	23	26	28
Mississippi	0	0	1	30	3	8	1	7	0	0	0	64	72
Missouri	0	0	0	0	0	0	0	0	0	0	0	5	5
Montana	3	13	0	3	1	0	1	6	2	2	7	44	51
Nebraska	0	6	0	0	0	0	0	0	0	0	0	16	16
New Mexico	6	31	1	6	2	10	0	16	0	0	9	65	74
New York	0	0	0	0	0	0	0	0	0	0	0	15	15
Ohio	12	18	0	3	0	3	0	3	2	0	34	177	184
Oklahoma	47	170	10	80	12	0	8	38	0	0	87	297	384
Pennsylvania	10	15	0	0	0	0	0	0	3	0	13	20	30
Tennessee	2	7	0	0	0	0	2	9	0	0	4	16	20
Texas	263	852	66	226	37	134	13	120	1	0	380	1395	1,745
Utah	0	1	0	0	0	0	0	0	0	0	0	1	1
West Virginia	4	17	0	0	0	0	10	15	0	0	14	22	30
Wyoming	17	12	3	0	3	1	1	2	0	0	24	17	41
Totals	596	2094	146 ¹	650 ¹	102 ²	263 ²	90	735	10	110	944	3852	4796

* Including geochemistry.

¹ Of these holes, 144 producers and 596 dry holes were located by seismograph.

² Of these holes, 102 producers and 248 dry holes were located by seismograph and geology.

TABLE VI
STATISTICS ON PROVED RESERVES IN AREA OF ELEVEN SELECTED STATES*

	1937	1938	1939	1940	1941	1942	1943	1944	1945
A. Proved reserves as of Jan. 1	12,241,885,000	14,664,035,000	16,630,455,000	17,723,393,000	18,226,542,000	18,816,785,000	19,260,415,000	19,070,764,000	19,347,407,000
B. Net change in proved reserves since Jan. 1 of previous yr.		+2,422,150,000	+1,966,417,000	+1,092,041,000	+593,149,000	+590,243,000	+443,630,000	-180,651,000	+276,643,000
C. New proved reserves discovered during year indicated	896,692,000	805,293,000	337,980,000	280,882,000	473,557,000	254,801,000	271,048,000	482,430,000	
D. New reserves added through extensions and revisions of existing reserves during year indicated									
E. Total new proved reserves added (C+D)	2,730,254,000	2,313,356,000	1,955,507,000	1,505,816,000	1,496,610,000	1,406,536,000	963,207,000	1,393,416,000	
F. Production during year indicated	3,635,046,000	3,118,640,000	2,493,496,000	1,786,698,000	1,920,161,000	1,757,337,000	1,234,255,000	1,875,846,000	
G. Newly discovered reserves (C) per foot of exploratory hole drilled in year indicated	1,213,796,000	1,152,231,000	1,200,555,000	1,283,490,000	1,359,018,000	1,307,707,000	1,423,906,000	1,590,203,000	
H. Newly discovered reserves (C) per foot of exploratory hole drilled in year indicated	417,647	321,217	133,857	97,834	137,115	83,843	76,652	114,456	
I. New proved reserves (E) per foot of exploratory hole drilled in year indicated	109.4	93.6	39.9	28.6	37.7	21.8	11.98	26.04	
J. New proved reserves (E) per foot of exploratory hole drilled in year indicated	1,693,500	1,243,976	908,315	622,326	621,612	576,287	349,052	445,041	
	443.88	362.52	271.36	182.07	170.75	140.79	86.38	101.27	

* This area includes Arkansas, California, Illinois, Indiana, Kansas, Louisiana, Michigan, Mississippi, New Mexico, Oklahoma, and Texas. All figures are in barrels. These figures on reserves are taken from the published annual reports of the American Petroleum Institute's Committee on Oil Reserves.

discoveries plus new-field discoveries, all made during 1944. Under D are the revisions and additions of estimated proved reserves in fields already discovered in previous years, these revisions and additions having been made partly on the basis of new information obtained through development during the year indicated, but mostly as a result of extensions made to old pools during that year. Under E all the new reserves (C+D) are totalled for each year.

If, for each year, we divide the newly discovered proved reserves (C, Table VI) by the number of exploratory holes drilled in that year, or by the total exploratory footage drilled in that year, we shall have a measure of the degree of success of exploratory drilling in terms of newly discovered proved reserves (G and H, Table VI); and if we divide the total new proved reserves (discoveries plus revisions plus extensions: E, Table VI) by the number of exploratory holes drilled, or by the total exploratory footage drilled, we shall have a rough measure of the degree of success of the exploratory effort (I and J, Table VI). Under G and H the measure is short. Under I and J, the measure may be too large or too small. In any case, there is an unavoidable error in estimating *rate of discovery*, or degree of success in wildcatting, measured in terms of new reserves; but the figures obtainable by these methods, as here described, are a significant index. As shown graphically in Figure 4, they reveal a marked drop in the rate of discovery from 1937 to 1943, inclusive, and this in spite of a steadily increasing footage drilled in exploratory holes and an increasing number of exploratory holes drilled each year. The marked increase in exploratory drilling, indicated in 1943 as compared with 1942, was still more strongly emphasized in 1944, both as to number of holes drilled and as to footage drilled. This great increase—19.2 per cent in number of holes and 29.6 per cent in total exploratory footage—helped to yield an increase in proved reserves amounting to 9.3 per cent of the proved reserves as of January 1, 1944, if we include 1944 production. This was for the "eleven states area." For the whole country the proved reserves as of January 1, 1944, were estimated by the American Petroleum Institute to be 20,064,152,000 barrels, and the proved reserves as of January 1, 1945, 20,453,231,000 barrels, thus showing a net increase of 389,079,000 barrels which, with the country's production of 1944, totalled 2,067,500,000 barrels. This was 10.3 per cent of the proved reserves as of January 1, 1944. In using these figures, however, one should remember that a considerable proportion of these new proved reserves is found through field development wells and through extension (successful outpost) wells. On the other hand, in subsequent years, new proved reserves, added through field development wells and extension wells of those years, will actually be a part of the success of 1944 discoveries of new oil.

In Table VII we have shown the distribution of the several classes of exploratory hole drilled in 1944. As might be expected, the percentage of success of outpost wells (from 32.47 per cent to 43.41 per cent in the different groupings of the states), of shallower-pool tests (from 66.67 per cent to 73.69 per cent), and of deeper-pool tests (from 33.00 per cent to 59.09 per cent), and also of new-pool

STATISTICS ON EXPLORATORY DRILLING AND PROVED OIL RESERVES IN AREA OF ELEVEN SELECTED STATES

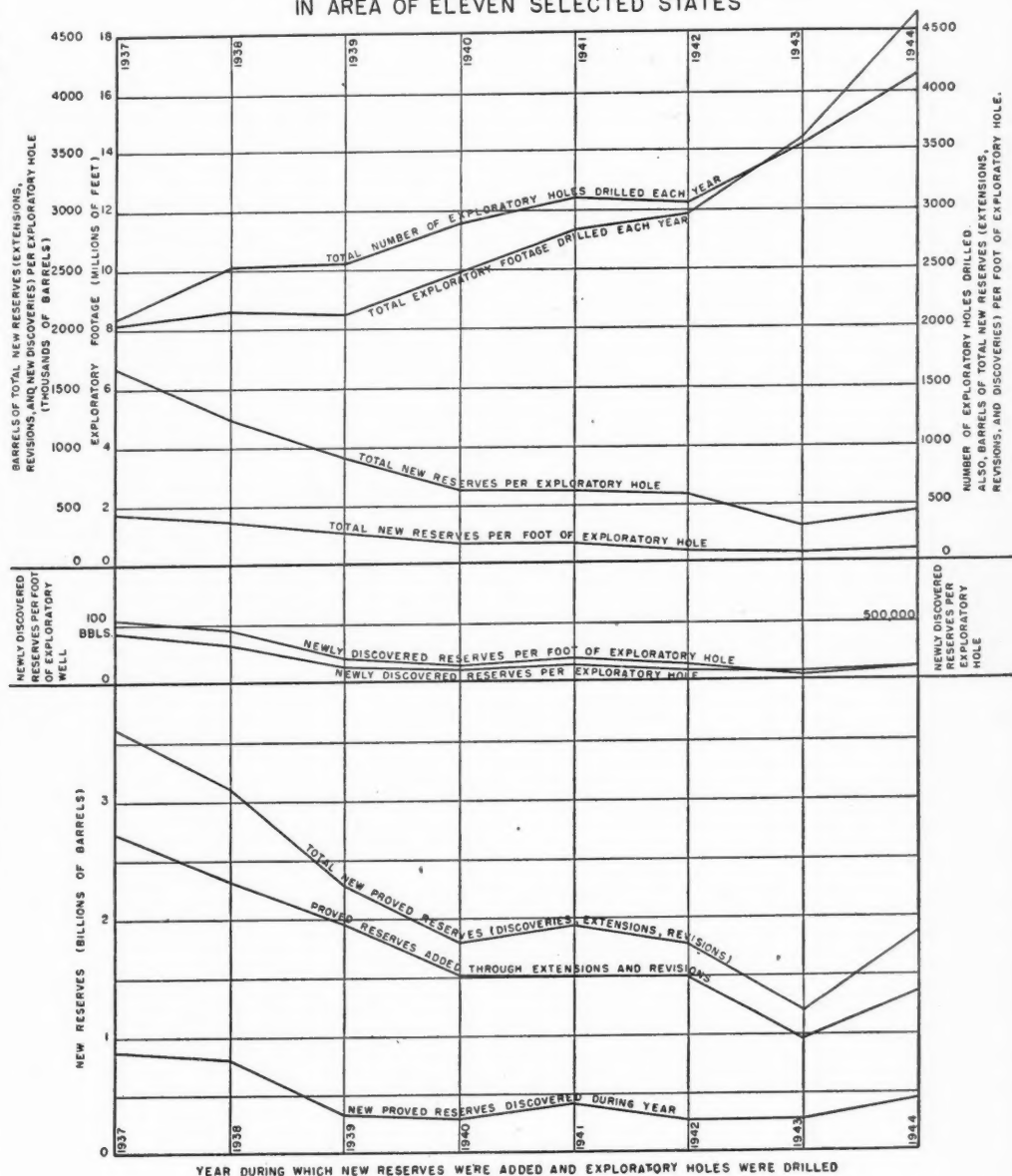


FIG. 4

TABLE VII
DISTRIBUTION OF EXPLORATORY WELLS OF 1944 BY CLASSES AND RESULTS OF DRILLING

	A All States Included in Table II		B Southern States Included in Table III		C* Eleven Selected States Included in Tables V and VI		D* States Included in Table II Except Eleven States in Tables V and VI		
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	
Outposts	Producers	315	41.72	164	40.89	277	43.41	38	32.47
	Dry holes	440	58.28	237	59.11	361	56.59	79	67.53
	Total	755	100.00	401	100.00	638	100.00	117	100.00
Shallower-pool tests	Producers	18	69.24	14	73.69	14	70.0	4	66.67
	Dry holes	8	30.76	5	26.31	6	30.0	2	33.33
	Total	26	100.00	19	100.00	20	100.00	6	100.00
Deeper-pool tests	Producers	90	41.86	37	33.00	77	42.07	13	50.09
	Dry holes	125	58.14	74	67.00	106	57.93	19	40.91
	Total	215	100.00	111	100.00	183	100.00	22	100.00
New-pool wildcats	Producers	179	25.35	101	28.53	145	22.79	34	48.57
	Dry holes	527	74.65	253	71.47	461	77.21	36	51.43
	Total	706	100.00	354	100.00	606	100.00	70	100.00
New-field wildcats	Producers	342	11.03	157	11.62	207	10.85	45	12.61
	Dry holes	2,752	88.97	1,196	88.38	2,441	89.15	311	87.39
	Total	3,094	100.00	1,353	100.00	2,738	100.00	356	100.00
Total producers		944		473		810		134	
Total dry holes		3,552		1,705		3,405		447	
Grand total		4,496		2,238		4,215		581	

* The horizontal totals of Columns C and D equal the items in Column A.

wildcats (from 22.79 per cent to 48.57 per cent), runs considerably higher than the percentage of success in new-field ("rank") wildcatting (from 10.85 per cent to 12.61 per cent). For this reason it has been suggested that during the present emergency the exploratory effort be concentrated on new-pool tests, and that much less drilling of new-field wildcats be undertaken. This idea may have been encouraged by the thoughts (1) that under this kind of a program less steel might be required, (2) that pipe-line facilities might already be available for newly found oil, and (3) that at least a part of the preliminary technical exploration would have been accomplished. However, in answer to these thoughts we would remind the advocates of this program (1) that much less steel is needed for a given number of new-field wildcats of average depth than for an equal footage of new-pool tests, (2) that pipe-lines are now pretty well filled and consequently new-pool discoveries might necessitate new pipe-line construction, and (3) that, even after completion of much geological and geophysical investigation, there still remains a large element of risk due to unknown geological conditions on structures that have produced oil. Any reduction in the search for new productive areas, any program that would seriously limit exploration by new-field wildcats, would be a serious menace to the prospects for finding adequate oil reserves in the next few years. We must beware lest the seemingly easily accomplished upward trend of discovery of new reserves along with the upward trend in exploratory drilling, during 1944, leads to a false impression that the same results may be as easily obtained at any time in the future. To maintain an adequate supply of oil reserves, the search for new fields, through new-field wildcatting, should be carried on uninterruptedly and with increasing vigor.

DEVELOPMENTS IN CALIFORNIA IN 1944¹

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ABSTRACT

Previous annual drilling records were exceeded through completion of 2,084 wells, 82 per cent of which were producers of oil or gas. This is an increase of 655 or 45.8 per cent over the number completed in 1943 as given in the report by Albert I. Gregersen and William W. Porter II a year ago. In all, 316 exploratory wells were completed, including 232 wildcats, 25 new pool tests and 59 outposts. Thirty-two (13.8 per cent) of the wildcats, nine (36 per cent) of the new pool tests, and thirty-one (52.5 per cent) of the outposts found production of oil or gas. These successful exploratory wells, 72 in all, or 22.8 per cent of all exploratory wells, had a total rated initial production of 16,035 barrels daily of oil and 96,316 MCF daily of gas (not including gas produced with oil). Completions in old oil pools numbered 1,396 and had a rated initial production of 330,410 barrels daily, a per well average of 237 barrels daily. Total production of oil was 311,771,000 barrels, an average of 854,167 barrels daily during 1944 compared with 778,597 barrels daily average during 1943. Total footage of exploratory drilling completed was 1,440,520 feet (273 miles) classified as follows: 1,066,750 feet of wildcats, 79,665 feet of new pool tests, and 294,105 feet of outpost wells.

INTRODUCTION

The results of exploratory drilling in 1944 are given in Tables I, II, and III which are continuations of the forms used a year ago.³

The measure of success for exploratory wells increased in 1944 to 22.8 per cent of the number of wells drilled and 22.7 per cent of the footage drilled. Comparable figures for 1943 are 18.0 per cent and 21.1 per cent, respectively.

Table IV divides exploratory drilling into wells drilled primarily for oil and those drilled primarily for gas, and further subdivides these two categories into wildcats, new pool tests, and outpost wells. There may be considerable argument about classifying wells as to the primary goal for which they were drilled, particularly if the well be abandoned without production. One geologist asked: "How can you tell what a well was drilled to find if it didn't find some?" There is merit in this question. It is possible, however, to separate oil-exploratory from gas-exploratory wells in a broad way by geographical location and results of previous drilling in each area. An exploratory well drilled, for example, near Rio Vista may be assumed to be searching primarily for gas, whereas one drilled near Wilmington probably has oil as its main objective.

DEVELOPMENT

The completion of 2,084 wells, of which 82 per cent were placed on production as oil or gas wells, set a new annual completion record. Total exploratory well completions amounted to 316, of which 72 (22.8 per cent) were producers of oil or gas. There were 62 successful completions in oil areas or 23 per cent of total exploratory wells drilled for oil. There were 10 successful completions in gas

¹ Manuscript received, April 2, 1945.

² Standard Oil Company of California.

³ Albert I. Gregersen and Wm. W. Porter II, "Developments in California in 1943," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 28, No. 6 (1944), pp. 743-50.

TABLE I
RESULTS OF EXPLORATORY DRILLING—DRY HOLES
WILDCAT DRY HOLES

Exploration Method Used to Locate WILDCAT Prospect	No. of Holes Drilled			Footage Drilled			Average Depth		
	1943	1944	Change	1943	1944	Change	1943	1944	Change
Surface geology	38	12	-26	161,882	55,084	-106,798	4,260	4,590	330
Subsurface geology	36	82	46	127,740	307,340	179,591	3,550	3,748	198
Surface and subsurface geology	16	9	-7	60,578	36,599	-23,979	3,785	4,066	281
Total geology	90	103	13	350,209	399,023	48,814	3,890	3,874	-16
Seismograph	27	36	9	164,326	220,104	55,778	6,085	7,114	1,029
Seismograph and subsurface geology	6	29	23	45,385	234,421	189,036	7,565	8,083	518
Seismograph and surface geology	2	1	-1	11,072	3,361	-7,711	5,535	3,361	2,174
Random drilling	40	19	-21	112,666	54,126	-58,540	2,815	2,849	34
Core drilling	—	12	12	—	20,005	20,005	—	1,667	1,667
Total WILDCAT	165	200	35	683,658	931,040	247,382	4,140	4,655	515

DRY HOLES OTHER THAN WILDCATS

Total exploratory other than wildcats	58	44	-14	265,563	183,014	-82,549	4,579	4,159	-420
GRAND TOTAL EXPLORATORY WELLS	223	244	21	949,221	1,114,054	164,833	4,256	4,566	310

TABLE II
RESULTS OF EXPLORATORY DRILLING—DISCOVERIES
WILDCAT DISCOVERIES

Exploration Method Used to Locate WILDCAT Prospect	No. of Holes Drilled			Footage Drilled			Average Depth		
	1943	1944	Change	1943	1944*	Change	1943	1944	Change
Surface geology	8	14	6	32,846	48,363	15,517	4,105	3,455	-650
Subsurface geology	2	4	2	8,826	14,412	5,586	4,413	3,603	-810
Surface and subsurface geology	—	—	—	—	—	—	—	—	—
Total geology	10	18	8	41,672	62,775	21,103	4,167	3,488	-679
Seismograph	10	6	-4	64,703	32,835	-31,868	6,470	5,472	-998
Seismograph and subsurface geology	1	7	6	8,351	39,360	31,009	8,351	5,623	-2,728
Seismograph and surface geology	—	—	—	—	—	—	—	—	—
Random drilling	—	1	1	—	740	740	—	740	740
Core drilling	—	—	—	—	—	—	—	—	—
Total WILDCAT	21	32	11	114,726	135,710	20,984	5,460	4,241	-1,219

DISCOVERIES OTHER THAN WILDCATS

Total exploratory other than wildcats	28	40	12	130,327	100,756	-29,571	4,005	4,769	764
GRAND TOTAL EXPLORATORY WELLS	49	72	23	244,053	236,466	-7,587	5,185	4,534	-651

* This is net "discovery" footage. An additional 25,322 feet was drilled as dry hole below producing levels of discovery wells.

TABLE III
RESULTS OF EXPLORATORY DRILLING—TOTALS
WILDCAT WELLS (Total)

Exploration Method Used to Locate WILDCAT Prospect	Footage Drilled			No. of Holes Drilled			Discovery Percentage			
	1943	1944	Change	1943	1944	Change	Footage		No. of Holes	
Surface geology	161,882	55,085	-106,798	38	12	-26	1943	1944	1943	1944
Subsurface geology	160,595	355,703	195,108	44	96	52	20.5	13.6	18.2	14.6
Surface and subsurface geology	60,404	51,011	-9,393	18	13	-5	12.7	28.3	11.1	30.8
Total geology	391,881	461,798	69,917	100	121	21	10.6	13.6	10.0	14.9
Seismograph	228,939	252,939	24,000	37	42	5	28.3	13.0	27.0	14.3
Seismograph and subsurface geology	53,736	273,781	220,045	7	36	29	15.5	14.4	14.3	19.4
Seismograph and surface geology	11,072	3,361	-7,711	2	1	-1	—	—	—	—
Random drilling	112,666	54,866	-57,800	40	20	-20	—	1.3	—	5.0
Core drilling	—	20,005	20,005	—	12	12	—	—	—	—
Total WILDCAT	798,294	1,066,750	268,456	186	232	46	14.4	12.7	11.3	13.8
TOTAL EXPLORATORY OTHER THAN WILDCATS										
Total exploratory other than wildcats	404,890	373,770	-31,120	86	84	-2	34.4	51.0	32.6	47.6
GRAND TOTAL EXPLORATORY WELLS	1,203,184	1,440,520	237,336	272	316	44	21.1	22.7	18.0	22.8

areas or 21.3 per cent of total exploratory wells drilled for gas. The 72 successful completions had a rated initial production of 16,035 barrels daily of oil and 96,316 MCF daily of gas (not including gas produced with oil).

Completions in older oil pools numbered 1396 and had a total rated initial production of 330,412 barrels daily (39 per cent of the total average daily output in 1944) a per well average of 237 barrels daily. This substantial addition to the productive capacity of the older fields together with development of newer fields and new discoveries enabled the state to increase its production from 792,508 barrels daily in December, 1943, to 885,234 barrels daily in December, 1944. Total production during 1944 was 311,771,000 barrels, an average of 854,167 barrels daily.

TABLE IV
SUMMARY OF EXPLORATORY DRILLING
CALIFORNIA—1944

	Total Footage	Net Discovery Footage	Net Dry Footage	Production		No. of Wells		
				B/D	MCF/D	Total	Disc.	Dry
DRILLED PRIMARILY FOR OIL								
Wildcats	844,706	102,302	742,404	4,262	20,000	101	25	166
New pool tests	77,700	28,018	49,691	5,028		24	8	16
Outposts	269,408	151,502	117,906	6,745		54	20	25
Total oil exploratory	1,191,823	281,822	910,001	16,035	20,000	269	62	207
DRILLED PRIMARILY FOR GAS								
Wildcats	222,044	33,408	188,636		53,146	41	7	34
New pool tests	1,956	1,956			15,704	1	1	
Outposts	24,697	9,280	15,417		7,466	5	2	3
Total gas exploratory	248,697	44,644	204,053		76,316	47	10	37
TOTAL EXPLORATORY WELLS								
Wildcats	1,066,750	135,710	931,040	4,262	73,146	232	32	200
New pool tests	79,656	29,974	49,691	5,028	15,704	25	9	16
Outposts	294,105	160,782	133,323	6,745	7,466	59	31	28
GRAND TOTALS	1,440,520	326,466	1,114,054	16,035	96,316	316	72	244

Total gas production during the year was approximately 556,530,000 MCF, a daily average of 1,524,700 MCF. This was 222,126 MCF greater than the daily average in 1943. The increase in daily gas production in 1944 amounted to about 37,000 barrels of oil on an approximate B.T.U. conversion basis.

Completion footage of exploratory wells reached the impressive total of 1,440,520 feet or 273 miles. Successful completion footage was 326,466 feet or 22.7 per cent of the total. The increase in exploratory footage drilled during 1944 is indicative of the splendid effort expended by the oil industry to meet the mounting demand for crude oil and its products on the Pacific Coast.

OIL DISCOVERIES

There were 25 new oil fields or new areas of production, 8 new pools in old oil fields, 7 new gas fields, and 1 new pool in an old gas field discovered during the year. In addition to these discoveries there were 29 extensions to oil fields and 2 extensions to gas fields. Table IV gives further statistical data on the various classifications of exploratory wells. Some of the more important discoveries are shown in Table V.

TABLE V
1944 DISCOVERIES IN CALIFORNIA
WILDCAT DISCOVERIES

OIL WILDCATS		County	Location S. T. R.	Comple- tion Date	Total Depth (feet)	Net Dis- covery Footage	Initial Production	Name of Producing Zone	Name of Field Discovered	Discovery Method
Operator	Discovery Well									
Ameruda	S.P. 36-15	Kern	15-39-30	7/13	4,159	2,235	70 B/D	Oleocene	Ant Hill	Subsurface geology and seismograph
Bentley	Vedder 14-1	Kern	14-28-28	10/25	2,666	2,666	200 B/D	Vedder	Round Mt.-West	Trend play and subsurface geology
Buckner & Capital Co.	Portals 53	Kern	3-30-30	9/16	4,770	4,770	240 B/D	Oleocene	Race Track	Subsurface geology and seismograph
Capital Co.	Well 2-1	Los Angeles	11- 2-11	7/12	1,285	1,285	40 B/D	Miocene	N. Whittier	Surface and subsurface geology
Di Giorgio	Di Giorgio 48-10	Kern	10-31-20	1/21	6,418	6,135	40 B/D	Plio-Mio.	?	Subsurface geology
General Pet.	Heath 1	Orange	34- 3-11	9/22	11,422	11,130	130 B/D	Pliocene	W. Buena Park	Subsurface geology and seismograph
Independent	Conoco 33	Kern	33-27-27	7/2	2,323	2,323	143 B/D	Chasac	E. Premier	Surface and subsurface geology
McDonald et al.	Pickinger 1	Kern	36-30-22	10/1	5,127	5,127	15,000 MCF/D	Oligocene	N.W. Elk Hills	Surface and subsurface geology
Panoche Pet.	Panoche 1	San Benito	24-16-10	12/20	740	740	10 B/D	Cretaceous	Vallecitos	Random drilling
Pauley	Loftus 1	Los Angeles	11- 3-15	8/9	7,356	7,356	50 B/D	Miocene	W. El Segundo	Subsurface geology
Richfield	Smith 1	Kern	1-30-28	12/4	4,994	4,994	130 B/D	Wicker	Fairfax	Subsurface geology
Richfield & Bender	Sheep Springs 2	Kern	17-30-21	9/22	3,487	3,487	600 B/D	Carneros	Sheep Springs	Surface and subsurface geology
Shell	Hopkins 37-X-31	Kern	31-27-20	6/2	2,017	2,520	30 B/D	Eocene	Antelope Plains	Subsurface geology and seismograph
Standard	67-17 E	Fresno	17-21-15	2/1	5,522	3,060	5,000 MCF/D	Tembler	N.W. Jocalitos	Surface and subsurface geology
Superior	Houghton 36-35	Kern	35-29-26	5/10	8,761	6,612	1,900 B/D	Stevens	Bellevue	Subsurface geology and seismograph
T.W.A.	KCL 44-22	Kern	22-30-26	8/12	8,132	7,950	143 B/D	Stevens	Conford	Subsurface geology and seismograph
T.W.A.	Porter 24-18	Kern	18-34-39	5/17	4,452	4,452	184 B/D	Wharton	N. Mt. View	Subsurface geology
Gas Wildcats										
Ameruda	Starkey Fee 1	Solano	2- 6- 2	8/28	9,434	9,434	22,570 MCF/D	Eocene	Dixon	Seismograph
Richfield	Alton. Comm. 1	Glenn	34-10- 1	2/13	5,222	3,100	6,200 MCF/D	Cretaceous	Alton	Seismograph
Richfield	Chico 1	Butte	17-21- 1	1/1	7,005	4,798	3,500 MCF/D	?	Chico	Seismograph
Standard	Honker Comm. 1A	Solano	25- 3- 1	4/7	8,304	7,797	3,200 MCF/D	Domergine	Honker Bay	Seismograph
Standard	Ruisun Comm. 3	Solano	5- 3- 1	9/28	5,645	3,675	7,350 MCF/D	Suisun sd.	Suisun Bay	Seismograph
Standard	Udell 1	Kings	29-23-22	0/4	5,650	3,310	14,400 MCF/D	Santa Joaquin	Udell	Seismograph and subsurface geology
Superior	Saltubehere 1	Tehama	12-24- 3	10/22	9,725	1,364	17,670 MCF/D	Pliocene	Corning	Seismograph

The number of new oil fields or new areas of oil production discovered is more impressive than the amount of oil which may be recovered from those discoveries. New oil-pool discoveries were less numerous than new fields but the former are rated much higher in future productive capacity than are the latter. New oil developed by extensions of old fields also added to the recoverable reserves. It is estimated that approximately 75 per cent of the 1944 production was compensated by new fields, new pools, and extensions of old fields. This indicates that the operators did a remarkably efficient piece of work in meeting the accelerated demand for crude and in assuring a supply of crude for the postwar years.

A few of the new fields or new areas of production merit comments in addition to the statistical data given in Table V.

The Amerada's S.P. well No. 36-15 discovered the Ant Hill field in July. This new field is about 5 miles north of Edison. The discovery well was rated good for 70 barrels daily. The same company completed S.P. well No. 8-15 in a lower zone, the Jewett, in November. There were 3 producing wells at the end of the year, 2 in the Olcese and 1 in the Jewett, proving more than 100 acres productive.

The British American and Capital Company completed Portals No. 53 in September for 240 barrels daily in the Olcese to open production in the Racetrack field about $1\frac{1}{2}$ miles north of Edison. There was only one producer in the field at the end of the year.

The Independent Exploration Company completed Conoco No. 33 in July for 143 barrels daily from the Chanac to open production in the East Premier field located about $\frac{3}{4}$ mile east of the Premier field. There were 4 producers at the end of the year. Estimated productive area was about 80 acres at the end of 1944.

The Richfield's Smith No. 1 had an initial production of 130 barrels daily from the Wicker and was the discovery well of the Fairfax field. There was no other producer completed during the year.

The discovery of Northwest Jacalitos is variously attributed to the Standard of California's well No. 67-17E, completed in February for 5,000 MCF daily of gas from the upper Temblor and to the Tide Water-Associated's Jacalitos No. 27-16, completed in July for 1,140 barrels daily of oil from upper Temblor. Fixing the blame for discovery of additional reserves does not alter the fact that Northwest Jacalitos adds to the oil and gas reserves of the state. The Jacalitos anticline now has three separate areas of production limited in extent by faulting and lithologic changes. There are, in addition, three different zones of production, not all of which have been proved productive in any one area. There were 16 producing wells at the end of the year and the proved productive area was estimated to be approximately 1,000 acres. Further exploratory and field drilling probably will extend the total productive area and certainly will clarify the relationships of different zones in the present three producing areas.

The Superior's Houghton No. 36-35 opened production in the Bellevue field in May. This new field is located about 3 miles southeast of Greeley. It was com-

pleted in the Stevens sands and had an initial production of 1,900 barrels daily. This looked like a promising discovery and led to the drilling of several near-by dry holes that definitely limited the extent of this field. There were three producing wells and an estimated productive area of about 125 acres at the end of the year.

The Tide Water-Associated's KCL No. 44-22 was the discovery well of the Gosford field in August. The well was located about $1\frac{1}{4}$ miles northeast of the Ten Section field. This is another Stevens sand producer and had a rated initial production of 143 barrels daily. A second well (KCL No. 62-22) was completed in October for an initial of 790 barrels daily. Two producers and about 200 productive acres outline the possibilities of this field at the end of 1944.

At least three of the successful new pool tests may be considered worthy of special mention.

The Continental's Grubb No. 31 was completed for 1,558 barrels daily initial from the Grubb Two zone of the San Miguelito field in April. This zone lies below Grubb One zone and derives its name from Grubb well No. 2 which touched the zone several years ago but was plugged back for production in Grubb One zone. Grubb Two zone had four producers averaging 250 barrels each daily at the end of the year. The productive area is not defined. This new pool discovery is one of the best for 1944.

The Standard of California discovered commercial production in basal Etchegoin sands in Buena Vista Hills by completion of its well No. 358-27B in March for 624 barrels daily initial. There were 46 producing wells having an allowable production of 16,400 barrels daily, 356 barrels per well daily, at the end of the year. Estimates of the proved productive area ranged from 2,800 to 3,800 acres. The development of this pool to the end of 1944 indicated that it was the most important discovery in the state. It was discovered by means of painstaking subsurface studies over a period of years.

The Union Oil Company discovered a new deeper pool in the Montebello field by completion of its Howard and Smith No. 3 in November for 210 barrels daily from the 9th zone (Miocene). There were no other completions during the year so that the extent and productive capacity of this new pool can not be estimated. It is important as new production from sands stratigraphically below previous producing zones.

Successful outpost wells added materially to the productive acreage and to the reserves of the state but no single completion could be designated as furnishing an outstanding addition to reserves.

It is interesting to note that the 1943 field discovery designated "the most important discovery" of that year⁴ has fulfilled the prophecy. The Pleasant Valley field had 17 wells producing about 176 barrels daily per well and an estimated proved productive area of about 525 acres at the end of 1944. It still deserved to be rated the most important oil discovery of 1943.

⁴ Gregersen and Porter II, *op. cit.*, p. 745.

GAS DISCOVERIES

The 7 gas fields and one new gas pool recorded for 1944 had insufficient development by the end of the year to warrant estimates of their importance as sources of future gas supply. Two or three of them may add substantially to the state's reserves.

EXPLORATORY METHODS AND RESULTS

Fourteen of the 32 fields discovered during 1944 were located through subsurface studies. Another 4 discoveries resulted from a combination of subsurface and surface geology and 7 more discoveries from a combination of subsurface geology and geophysical work. Subsurface geology, therefore, played a major role in the discovery of new fields. Six field discoveries, all gas, are attributed solely to seismograph plays. It is of interest to note that one small discovery resulted from random drilling.

The success percentage of subsurface geology prospects was 13.6 on footage and 14.6 on number of holes. Comparable figures for seismograph plays were 13.0 and 14.3, respectively. All wildcats attained 12.7 per cent success as to footage drilled and 13.8 per cent success as to number of wells drilled. The comparable figures for 1943 were 14.4 per cent and 11.3 per cent, respectively. Note that the percentage of wildcats successful in 1944 was greater than in 1943 but that the success factor as to footage was lower in 1944.

Successful exploratory wells, other than wildcats, jumped to 51 per cent of footage drilled and 47.6 per cent of wells drilled. The comparable figures for 1943 were 34.4 per cent and 32.6 per cent. Many of these other-than-wildcat wells were drilled on the findings of subsurface studies.

The percentages of successful results as here given, and more completely in Table III, suggest that the major crop of geophysical discoveries may have been harvested. The indications are that further painstaking studies of subsurface conditions will have great influence on the future discovery rate.

Geophysical activity dropped slightly during the year. There were 7 gravimeter and 17 seismograph parties operating in the state at the end of 1944 as compared with 8 gravimeter and 21 seismograph parties at the beginning of the year.

DEEP WELL

The deepest-well-in-the-world record⁵ was returned to California during the year. The Standard of California's KCL well No. 20-13 was drilled to the depth of 16,246 feet. This depth record was accomplished with ordinary heavy drilling equipment lacking any special or fancy features and without serious break-downs or protracted fishing jobs.

Approximate positions of interesting formations encountered in this well are as follows.

⁵ Since regained for Texas by the Phillips Petroleum Company's Schoeps No. 3 in Brazos County.

	<i>Depth in Feet</i>
Pliocene-Miocene contact	6,530
Top of Miocene cherts	8,640
Probable equivalent of Stevens sands	9,300
Bentonite	10,950
Top of middle Miocene	12,800
Possible equivalent of Vedder sand	15,000
Probable lower Miocene below	15,650

The bulk density of shale and sandstone below 15,800 feet was slightly more than 2.6 and the porosity ranged from 1.03 per cent at 15,081 feet to 0.29 per cent at 16,166 feet. There was slickensiding and a suggestion of flowage of material near the bottom of the hole. These data suggest that the deeply buried Miocene rocks have been subjected to incipient metamorphism.

The well was not completed in 1944 but had reached its total depth by the end of the year and seemed of sufficient interest to mention in this summary of developments. It was abandoned early in 1945 without obtaining production.

FUTURE TRENDS

Drilling of exploratory and development wells should continue at a high rate in 1945. The demand for crude petroleum and its products has continued to rise on the Pacific Coast. This increasing demand can be met in the near future only by completing new producers in the old fields, extending the productive limits of those fields, and by discovering new fields and new pools to augment the present supply of crude. It would seem that the current daily rate of production is close to the state's capacity to produce. Further demands must be met by new discoveries. The task of finding new fields and new pools is not an easy one. Results in 1944 indicate that there are accumulations of oil in stratigraphic traps and deeper pools still untouched. It will require intensified exploration and continued critical analysis of available data to locate these future reserves. The percentage of hits may go down, that is, the risk goes up, but the real marksmen, of which there is no scarcity in California, will continue to score hits "in spite of hell and dry holes"—to garble an old saying.

Eight years ago a California geologist sent to a geologist friend in New York the following message: "Don't sell California short on oil yet." That is still an appropriate admonition.

DEVELOPMENTS IN CANADA IN 1944¹

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ABSTRACT

All discoveries in Canada in 1944 were in Alberta. These are as follows: Jumpingpound area, 20 miles west of Calgary on the eastern edge of the Foothills where at a depth of 9,947 feet in Mississippian limestone production of gas with oil was obtained; the Princess area, 125 miles east of Calgary where at less than 4,000 feet oil was obtained in Devonian limestone; Conrad, 20 miles southwest of Taber with production in the Ellis (Jurassic sand) at a depth of about 2,970 feet; West Taber or Barnwell, 3½ miles west of Taber, with production in the Taber sand of Lower Cretaceous age at a depth of about 3,250 feet. Important extensions were made particularly at Lloydminster on the boundary between Saskatchewan and Alberta where wells on the south and west gave promise of greatly extending the producing areas in this district and in north Turner Valley where a discovery was made on a fault block west of the producing area but constituting a part of the main Turner Valley structure.

In the McMurray area of Alberta the plant of Abasand Oils Ltd., sponsored by the Dominion Government, was put into operation. This is the experimental plant to mine the Athabaska bituminous sands and extract oil from them to determine if commercial operations are feasible.

In the Northwest Territories further drilling developed the Norman Wells field but no discoveries were made. Drilling in Southern Saskatchewan has been disappointing. Four deep wells were drilled in 1944 and several in western central Saskatchewan where some gas and heavy oil was found.

In eastern Canada two tests in Cape Breton, Nova Scotia, failed to find production and a deep test on Prince Edward Island is suspended for the winter but not yet completed. Operations are continuing in the Gaspé Peninsula of Quebec where seepages occur and small amounts of oil have been found by drilling.

INTRODUCTION

The area covered in this report is the whole of Canada. No developments occurred in either Manitoba or British Columbia although extensive geological investigations were carried out by two oil companies in the latter province along the Alaska Highway. The area in northeastern British Columbia that has prospective oil value includes about 40,000 square miles in and east of the foothills of the Rocky Mountains.

Drilling for oil has occurred in Canada in 1944 in Alberta, Saskatchewan, Nova Scotia, Prince Edward Island, Quebec, and in the Northwest Territories. There have been no new explorations in New Brunswick and the drilling in Ontario is mainly in the search for new natural-gas supplies. Drilling under the Canol project continued in the Norman Wells field in the Mackenzie district of the Northwest Territories and by Imperial Oil in the areas adjoining this field. No new discoveries were made.

DEVELOPMENT

In Alberta an all-time record was established in 1944 with 597,828 feet of drilling. There were 140 completions as follows: Turner Valley 42 (38 successful); other foothills completions 3 (1 successful); Southern Alberta 62 (14 with oil or gas including 4 discoveries); Vermilion 14 (12 with oil); Lloydminster 8 (all oil); others in east central Alberta 11 (including 3 gas wells).

In Canada the main oil production has heretofore come from Alberta, prin-

¹ Manuscript received, March 31, 1945.

² Geologist for the Oil Controller for Canada.

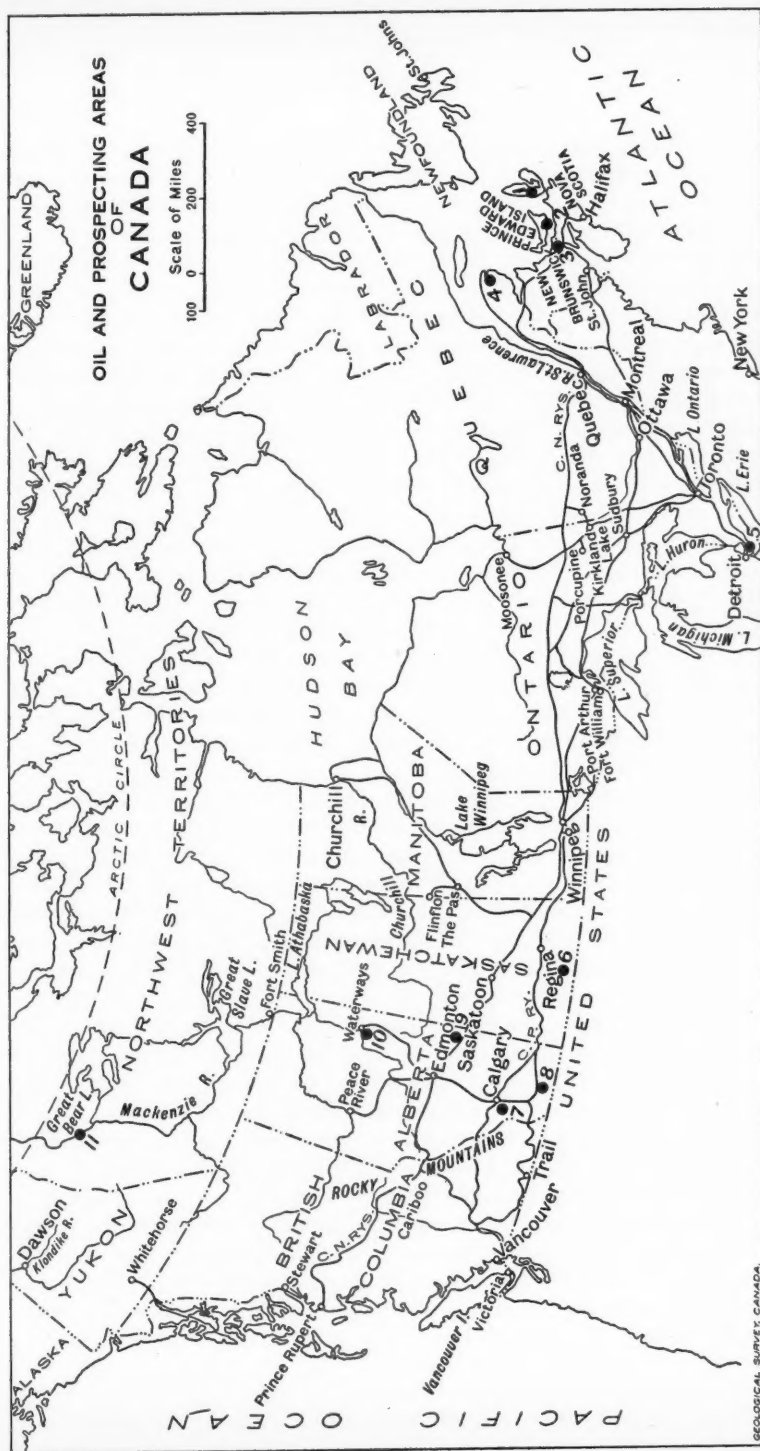


FIG. 1.—Oil and prospecting areas of Canada. 1, Mabou area, Cape Breton Island, Nova Scotia; 2, Hillsborough Bay, Prince Edward Island; 3, Stony Creek gas and oil field, New Brunswick; 4, Gaspe prospective oil area, Quebec; 5, Producing oil and gas fields, southwest Ontario; 6, Southern Saskatchewan wildcat areas; 7, Foothills in Calgary area, Alberta; 8, Southern Alberta fields and wildcat areas; 9, East-central Alberta fields; 10, Athabasca bituminous sands, northern Alberta; 11, Norman Wells field, Northwest Territories.

cipally from Turner Valley. This field is now normally declining and production of crude oil in 1944 was 7,878,128 barrels, a decrease of 1,113,400 barrels from 1943. There was an increase, however, of 240,560 barrels from other fields in the province and production from these is becoming increasingly important.

In southern Saskatchewan, the Imperial Oil Company and Norcanols, in which the Imperial Oil Company is largely interested, has since 1940 carried out a large exploration and drilling campaign. Large areas have been examined geologically supplemented by gravimeter and seismic surveys and core drilling. Drilling commenced in 1942 and since that time 8 deep wells have been drilled, one of which reached the pre-Cambrian at the depth of 9,395 feet. Oil showings have occurred but no discoveries have been made. Drilling is being continued.

In 1944, 30 wells were drilled under the Canol project in the Norman Wells field, Mackenzie River area, N. W. Territories. At the end of 1944 there were 56 wells capable of producing oil. Discovery well No. 1, drilled in this field in 1920, was abandoned in 1944 and one other well is being used for intake gas. Production in the field in 1944 amounted to 1,229,324 barrels. The refinery at Norman Wells operated during the summer. Oil was put into the Norman Wells-Whitehorse pipe line at the end of 1943 and the pipe line operated throughout 1944.

Since the inception of the Canol project in 1942 several wildcat wells have been drilled by the Imperial Oil Company. Four were completed in 1944. None of these has been successful. The wells are in an area from Bluefish Creek, 40 miles upstream from Norman Wells to Sans Sault Rapids, 70 miles downstream. All are on or close to Mackenzie River.

In eastern Canada the drilling of the Prince Edward Island well has attracted considerable attention because of the fact the well is on piers built in Hillsborough Bay. Drilling began in 1943 and was continued through 1944 at the end of which the well was suspended for the winter without having penetrated the complete section of non-marine Pennsylvanian beds which overlie the Mississippian strata where it is hoped to find oil. The well is now at a depth of slightly more than 11,600 feet and it is expected drilling will continue in 1945. This is a test of a structure outlined by seismic methods.

In the Mabou area of Cape Breton Island, Nova Scotia, a well drilled by the Lion Oil Refining Company reached the depth of 5,579 feet in red and gray gypsiferous shales. The well has been abandoned without reaching the base of this succession and a new well is being drilled about $\frac{3}{4}$ mile northwest of the first location. At the east there are oil seepages in the Lake Ainslie area and it is hoped to reach the beds from which the seepages are believed to originate.

In Gaspé, Quebec, Continental Petroleum Ltd. has continued its explorations. A well commenced in January, 1944, has been drilled to the depth of 2,556 feet. Drilling commenced in Middle Devonian sandstones and several showings of oil have been encountered in the underlying limestones. Attempts are now being made to acidize the well into production. Sir William Logan first reported seepages in Gaspé in 1842 and it was the study of the structures with which these

were connected that led Sterry Hunt and Sir William Logan to postulate the anticlinal theory of oil accumulation. There are many favorable oil structures in Gaspé, but it has long been recognized that the main essential so far lacking to obtain oil in commercial quantities has been the discovery of adequate reservoir beds. There is still hope that these may be revealed by drilling.

NEW FIELDS DISCOVERED

JUMPINGPOUND

All new fields discovered in 1944 are in Alberta. Two discoveries, at least, appear to be of outstanding importance. The first was the discovery of gas and oil in the Jumpingpound well, 20 miles west of Calgary, in the Palaeozoic limestone, the top of which was reached at the depth of 9,618 feet after 180 days of drilling. The structure on which this well was drilled lies under and in front of the fault plate which constitutes the eastern edge of the structural foothills belt. All previous drilling in the Jumpingpound area had been on this fault plate, the objective being to find Palaeozoic limestone above the fault. Only one well, Shell Norman, completed in 1943, had achieved this objective although several previous attempts dating back to 1914 had been made. The Shell Norman well reached the top of the Palaeozoic limestone (Mississippian) at 11,588 feet but had only oil and gas showings with water. The development of the front fold under and east of the fault plate was the result of the publication of a Geological Survey report in 1940 in which favorable structural conditions were outlined, followed by a limited amount of seismic work by the Heiland Exploration Company for the firm of Brown, Moyer and Brown, who, at that time, largely controlled the acreage. As a result of this information the Shell Oil Company became interested in the area, and, after extensive seismic work, drilled the Shell Norman followed by the discovery well, known as Shell 4-24-J. The exceptional feature of this well is that it drilled through the eastern edge of the Jumpingpound fault plate to reach the structure underlying and in front of it. The well gave a large gas flow with some oil and is believed to be high on the structure. A second well somewhat south and west has been located for a further test.

PRINCESS

The other very important discovery made in 1944 was Standard Princess well No. 8 drilled in the Princess area of the Plains, 125 miles east of Calgary. This well was completed at the depth of 3,983 feet in Devonian limestone, the top of which occurred at the depth of 3,912 feet. Oil of 34.5° gravity was obtained. There had previously been a number of wells drilled in this area and, although most of these had not reached the Devonian limestone, one well, Princess No. 1, had given substantial flows of gas and some oil from Devonian rocks. Princess well No. 8 was located as an offset west of Princess well No. 1. The discovery is important not only in indicating production for the first time from the Devonian of the Plains, but in greatly stimulating the drilling of other wells to test the same zone.

The importance of the field can not yet be estimated in that no other wells have been completed.

About 7 miles east and 2 miles south of Princess well No. 8, another interesting

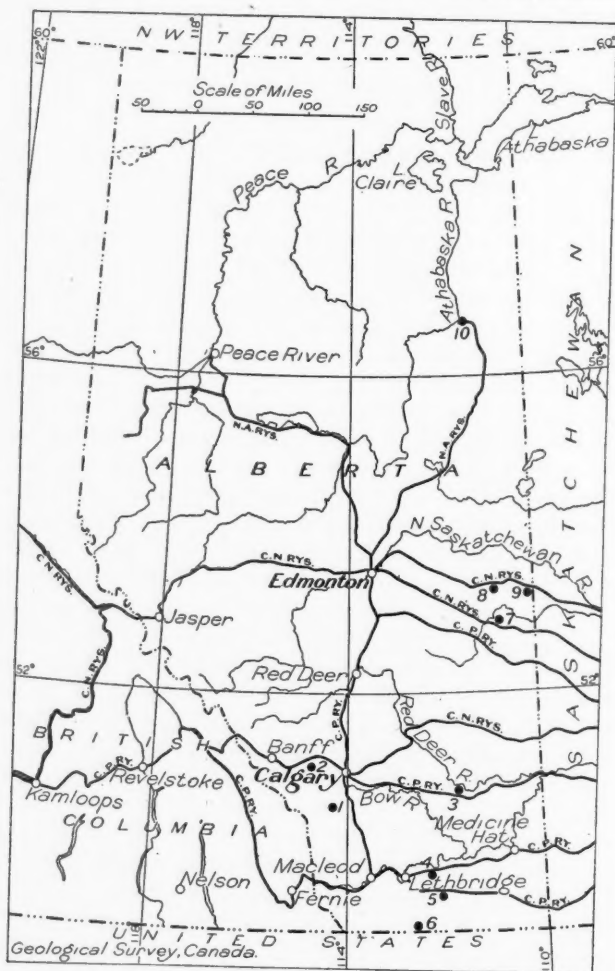


FIG. 2.—Oil areas in Alberta. 1, Turner Valley; 2, Jumpingpound; 3, Princess; 4, Taber; 5, Conrad; 6, Twin River; 7, Wainwright; 8, Vermilion; 9, Lloydminster; 10, Athabaska bituminous sands.

discovery of oil was made by Princess Steveville Syndicate well No. 1 in the Bow Island sand near the base of the Upper Cretaceous shales at the depth of 2,516 to 2,567 feet. This well, however, yielded only about 20 to 25 barrels of oil a day

initially, and again the importance of the discovery is unknown since a second well to the same sand gave negative results and was deepened to a lower gas zone. The Bow Island sand has been an important reservoir rock for gas in the Bow Islands and Foremost fields, but this is the first time oil has been recovered from it.

CONRAD

In the Conrad area 20 miles southwest of Taber in Southern Alberta, a producing sand has been found in the Ellis (Jurassic) formation. The discovery well Conrad Province No. 2, was drilled to the depth of 3,090 feet and plugged back to test the Ellis sand above 2,972 feet. It initially yielded about 145 barrels a day of 25° API black oil. Another well drilled $\frac{3}{8}$ mile southeast found the same zone saturated with oil in a thicker sand. The structure appears to be a stratigraphic trap on the west flank of the Sweetgrass arch.

The structure in the Taber-Conrad area has been determined by seismic surveys and by drilling structural test holes mainly to the Milk River sandstone at depths to several hundred feet. The wells are correlated by electrologs. The whole country is relatively flat, covered by some drift with outcrops only in the coulees. The regional structure and stratigraphy was determined by surface geological studies but all discoveries have come from the application of geophysics and core drilling.

BARNWELL OR WEST TABER

A few miles west of the Taber field, south of Barnwell, Major Taber No. 1 discovered gas and oil in the Taber sand in the Lower Cretaceous at the depth of 3,234 to 3,257 feet. This was followed by the drilling of Major Taber No. 3 well about $\frac{1}{2}$ mile northeast and by Standard Taber Province 87-15A and 67-15A about one mile still farther northeast and 1,320 feet apart. All of these wells yielded oil of about 18° to 20° API. It therefore appears as if a field extending over a considerable area may have been found.

About 8 miles south and 5 miles east of Taber and 13 miles north and 2½ miles west of the Standard Conrad discovery well, that is, in the intermediate area, the Imperial-British Dominion well No. 1 made a discovery of oil in the Taber sand at the depth of 3,175 to 3,192 feet. This was confirmed by well No. 2 drilled close by, but both wells have had water difficulties. At the present time the importance of this find does not seem to be great but with the other discoveries in the area it points to a reasonable prospect of developing more fields.

TWIN RIVER

About 40 miles southeast of Lethbridge at Twin River, the Pacific Oil and Refinery well No. 2 obtained some light oil in the top of the Mississippian limestone at the depth of 3,913 to 3,927 feet. This is not entirely a new discovery because other wells in this area have found oil in the same zone and one well, Terminal No. 1, produced 2,633 barrels during 1944. The Terminal well, how-

ever, is 4 miles south and $3\frac{1}{2}$ miles west of the Pacific Oil and Refinery Twin River well No. 2.

EXTENSIONS TO KNOWN FIELDS

TURNER VALLEY

In the Turner Valley field drilling in 1944 continued to extend the north end. In a fault block on the east side of the north end, where a discovery was previously made, there was some further drilling, but it appears as if the size of the producing area in this fault block may be relatively small. This fault block is important in that it apparently indicates faulting after oil accumulation. On the west side of the north end, Home Millarville well No. 18, in 1944, drilled into another fault block with the east edge of the Palaeozoic limestone uplifted above that in the area immediately east of it. This well has drilled the productive zone both above and below the fault and there is a possibility the fault block will extend the productive area considerably farther northwest. Most of Turner Valley is a west-dipping fault block cut off by a major fault on the east edge. At the north end the main fault block has been compressed and broken into a series of fault blocks overlapping one another. No doubt the fracturing accompanying this faulting has been a contributing factor in the larger production of wells in this part of the field. The extension found in 1944, therefore, may be of very considerable importance.

PLAINS

In east-central Alberta new extensions occurred in the Lloydminster field where the discovery oil well was drilled in 1939, but where there has been little activity until 1943. A well, Silverdale No. 1, $3\frac{1}{2}$ miles south and $1\frac{1}{2}$ miles east of the main producing area, obtained a coarser producing sand at the same stratigraphic position as the other wells, that is, about 165 feet below the top of the Lower Cretaceous and is yielding oil on the pump at the rate of 35 to 40 barrels a day. The oil is heavy. A Petreco unit for the breaking of the emulsion has been installed at Lloydminster so that new developments in this area are probable as the oil is needed for fuel by Canadian National Railways on their mountain divisions.

About 7 miles west and 2 miles north of the center of the Lloydminster producing area, oil-saturated sands have been found in Lloydminster Oil Producers well No. 1 at the depth of 2,005 feet in a Lower Cretaceous sand. The importance of this discovery is not yet known. The location of the well was made with little available geological information.

About 3 miles east and 18 miles north of Vermilion, Iscriis well No. 1 was drilled to 2,133 feet at the top of the Devonian limestone. A number of saturated oil sands were found in the Lower Cretaceous. No production resulted but further drilling is to be done. This well was located as the result of geological surface studies followed by seismic surveys. It is believed there is a ridge of Devonian limestone in this area under Cretaceous strata. The area looks promising for further development.

DEVELOPMENTS IN CANADA IN 1944

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WILDCAT AND SEMI-WILDCAT WELLS DRILLED IN CANADA IN 1944

Name of Well	Location Lsd-Sec-Tp-R-Mer.	Depth (Feet)	Formation Reached	Results
ALBERTA				
<i>Foothills</i>				
Royalite Wildcat Hills	Ls 16-30-27-5W ₅	11,155	Miss. limestone	Abandoned
*Shell Jumpingpound	Ls 4-24-25-5W ₅	9,947	Miss. limestone	Gas and oil
Transcontinent	Ls 1-36-18-3W ₅	3,333	Miss. limestone	Abandoned
<i>Southern Plains</i>				
McColl-Frontenac	Ls 6-8-1-8W ₄	4,420	Mississippian	Abandoned
McColl-Frontenac	Lsd 9-17-1-8W ₄	3,328	Mississippian	Abandoned
B. A. Foremost	Ls 2-33-7-9W ₄	3,298	Mississippian	Abandoned
*Princess Steveville Syn.				
No. 1	Ls 7-14-20-11W ₄	2,567	Upper Cretaceous	Oil
Princess Steveville Syn.				
No. 2	Ls 2-14-20-11W ₄	3,275	Mississippian	Gas
Birdsholm Province No. 1	Ls 14-33-4-11W ₄	3,131	Mississippian	Abandoned
*Standard Princess No. 8	Ls 16-21-20-12W ₄	3,983	Devonian	Oil
Foremost Province No. 1	Ls 1-14-5-12W ₄	3,226	Mississippian	Abandoned
Imp. Erickson Coulee No. 1	Ls 2-16-1-12W ₄	2,679	Mississippian	Abandoned
Mayland Ronolane No. 1	Ls 1-7-13-12W ₄	2,091	Upper Cretaceous	Abandoned
Crow Indian Lake No. 1	Ls 6-27-4-13W ₄	3,085	Mississippian	Abandoned
Crow Indian Lake No. 2	Ls 1-20-4-14W ₄	2,989	Mississippian	Abandoned
Grassy Lake Province No. 1	Ls 3-15-9-13W ₄	3,276	Mississippian	Abandoned
Legend Province No. 1	Ls 2-15-7-13W ₄	3,521	Mississippian	Abandoned
Legend Province No. 2	Ls 14-4-6-12W ₄	3,193	Mississippian	Abandoned
Legend Province No. 3	Ls 13-23-7-13W ₄	3,286	Mississippian	Abandoned
Imp. Grassy Lake No. 2	Ls 16-6-10-13W ₄	3,107	Mississippian	Abandoned
Eureka Province No. 1	Ls 9-19-8-13W ₄	3,258	Mississippian	Abandoned
Imperial Scope No. 1	Ls 13-21-12-14W ₄	3,275	Mississippian	Abandoned
Imperial Scope No. 2	Ls 13-24-12-15W ₄	3,254	Mississippian	Abandoned
Riley Lloyd No. 1	Ls 16-5-23-14W ₄	4,197	Mississippian	Abandoned
Imp. Armelgra No. 2	Ls 1-23-13-14W ₄	3,360	Mississippian	Abandoned
Green Apex No. 1	Ls 15-17-7-14W ₄	2,978	Mississippian	Abandoned
Imp. Purple Springs No. 1	Ls 13-11-10-15W ₄	3,211	Mississippian	Abandoned
Conrad Province No. 1	Ls 8-11-5-15W ₄	3,110	Mississippian	Abandoned
*Conrad Province No. 2	Ls 1-5-6-15W ₄	2,963	Jurassic	Oil
Conrad Province 55-33B	Ls 11-33-5-15W ₄	3,234	Mississippian	Testing
Conrad Province 55-5A	Ls 11-5-6-15W ₄	3,138	Mississippian	Jurassic
Conrad Province 55-21B	Ls 11-21-5-15W ₄	3,491	Mississippian	Abandoned
*Imp. Br. Dom. Conrad No. 1	Ls 13-6-8-15W ₄	3,200	Lower Cretaceous	Oil & water
Lion Taber No. 1	Ls 8-22-7-15W ₄	3,001	Mississippian	Abandoned
Mid-Continent No. 2	Ls 14-24-6-15W ₄	3,235	Mississippian	Abandoned
Mid-Continent No. 3	Ls 13-1-8-17W ₄	3,348	Mississippian	Testing oil in
Mid-Continent No. 4	Ls 11-1-8-17W ₄	3,273	Lower Cret.	Lower Cret.
Mid-Continent No. 5	Ls 11-35-7-16W ₄	3,393	Mississippian	Abandoned
Mid-Continent No. 7	Ls 11-17-6-15W ₄	3,181	Mississippian	Testing oil in
Mid-Cont. Universal No. 1	Ls 12-17-9-17W ₄	4,724	Devonian	Jurassic
*Major Taber No. 1	Ls 12-9-9-17W ₄	3,257	Lower Cret.	Abandoned
*Major Taber No. 2	Ls 4-9-9-17W ₄	3,369	Mississippian	Gas and oil
*Taber Province 87-15A	Ls 13-15-9-17W ₄	3,253	Mississippian	Abandoned
Imp. H. B. Barnwell No. 1	Ls 15-8-9-17W ₄	3,355	Mississippian	Oil in Lower
Imp. Clancey No. 3	Ls 4-27-8-16W ₄	3,294	Mississippian	Cretaceous
Noble (McLeod) No. 1	Ls 14-33-8-17W ₄	3,328	Mississippian	Abandoned
Universal Pete No. 1	Ls 15-25-8-17W ₄	3,540	Mississippian	Abandoned
Universal Pete No. 2	Ls 3-24-8-17W ₄	3,341	Mississippian	Abandoned

* Discovery well.

1 Barnwell or West Taber field.

WILDCAT AND SEMI-WILDCAT WELLS DRILLED IN CANADA IN 1944—Continued

McColl Frontenac-Br. Dom.	Ls 12-17-1-17W ₄	3,366	Mississippian	Abandoned
Chin Province No. 2	Ls 8-36-8-18W ₄	3,495	Mississippian	Abandoned
B. A. Milk River No. 1	Ls 8-30-2-16-W ₄	2,970	Mississippian	Abandoned
Pacific Oil & Ref.				
Twin River No. 2	Ls 13-2-2-20W ₄	3,927	Mississippian	Oil
New Ranchmens Snider	Ls 16-34-19-29W ₄	7,928	Mississippian	Abandoned
<i>East-Central Alberta</i>				
*Silverdale	Ls 10-12-49-1W ₄	1,900	Lower Cret.	Oil
*Lloyd. Oil Producers No. 1	Ls 12-10-50-2W ₄	2,005	Lower Cret.	Oil
Great Bend Oils No. 1	Ls 4-28-52-3W ₄	1,924	Lower Cret.	Suspended
Iscris-M 1	Ls 13-35-53-6W ₄	2,133	Devonian	Abandoned
May No. 1A	Ls 4-27-51-11W ₄	2,348	Devonian	Suspended
Imp. Viking No. 3	Ls 3-29-45-12W ₄	2,940	Devonian	Abandoned
SASKATCHEWAN				
Imperial Lawson	Ls 16-13-21-6W ₃	6,420	Paleozoic	Abandoned
Norcanols Wilcox	Ls 16-32-13-20W ₃	6,373	Paleozoic	Abandoned
Norcanols Gap No. 1	Ls 16-3-3-25W ₃	7,767	Paleozoic	Abandoned
Norcanols Radville No. 2	Ls 16-36-5-19W ₃	5,121	Paleozoic	Abandoned
Vera No. 3	Ls 11-12-42-24W ₃	2,040	Devonian	Heavy oil
Vera Ventures No. 1	Ls 10-36-41-24W ₃	2,116	Devonian	Suspended
Bata No. 1	Ls 8-14-39-23W ₃	2,132	Devonian	Abandoned
Bata No. 2	Ls 11-24-39-23W ₃	2,145	Devonian	Gas
Bata No. 3	Ls 3-10-40-23W ₃	2,370	Devonian	Suspended
NORTHWEST TERRITORIES (Mackenzie River Area)				
Mac No. 2	West side of Mackenzie River in Norman Wells area	2,958	Upper Devonian	Abandoned
Ray No. 1	West side of Mackenzie River in Norman Wells area	3,817	Upper Devonian	Abandoned
Sans Sault No. 1	About 70 miles down Mackenzie River from Norman Wells on west bank	3,123	Bear Rock formation (Silurian?)	Suspended
Morrow Creek	About 20 miles down Mackenzie River from Norman Wells	2,024	Bear Rock formation (Silurian?)	Abandoned
NOVA SCOTIA				
Lion Oil Refining Co.				
Mac No. 1	South of Mabou Inlet, Cape Breton Island	5,579	Miss.	Abandoned
Mary No. 1	$\frac{3}{4}$ mile northwest of Mac No. 1	—	Miss.	Abandoned
PRINCE EDWARD ISLAND				
Island Development Co.	In Hillsborough Bay	11,688	Pennsy.	Suspended
Hillsborough No. 1	off Governor Island			
QUEBEC				
Continental Petroleum Ltd.				
No. 1	Galt township	2,120	Devonian	Suspended
No. 2	Galt township	2,556	Devonian	Testing

* Lloydminster area.

EXPLORATORY METHODS AND RESULTS

In Western Canada the following parties operated in the summer of 1944.

	Geological	Seismic	Gravimeter	Core Drilling
<i>Alberta</i>				
Oil companies	19	5	4	3
Geological Survey of Canada	6			
<i>Northeastern B.C.</i>				
Oil companies	8 (2 oil companies)			
<i>Saskatchewan</i>				
Oil companies	3	1		3
Geological Survey of Canada	1			
<i>Northwest Territories</i>				
Oil companies	2	1		
Geological Survey of Canada	1			

It is expected that the large scale exploration activity of 1944 will be continued in 1945 with less drilling in Turner Valley, but perhaps more in other areas.

ATHABASKA BITUMINOUS SANDS

Late in 1944 the plant of Abasand Oils Ltd. on Horse River, a tributary of the Athabaska near McMurray, Alberta, was put into operation. This is an experimental plant built under the sponsorship of the Government of Canada to investigate problems of mining and extraction and ascertain the costs of these operations. Both the extraction plant and refinery to recover the dilutant used in extraction, have been rebuilt and drilling has been done to determine the size and grade of the deposit. This pilot plant will be used to determine if commercial operations are feasible and what methods are practicable.

BIBLIOGRAPHY 1944

ALBERTA

- G. S. HUME, "Seismic Surveys and Their Relation to Oil Prospects in Wainwright Area, Alberta," *Geol. Survey Canada, Paper 44-1*.
 M. FENIAK, "Athabaska-Barrhead Map-Area, Alberta," *ibid.*, Paper 44-6 (report and map).
 A. H. LANG, "Drinnan to Brule Lake, Athabaska Valley, Alberta," *ibid.*, Paper 44-11 (report and map).
 F. H. McLEARN, "Revision of the Lower Cretaceous of the Western Interior of Canada," *ibid.*, Paper 44-17.
 G. P. CROMBIE, "Alexo Map-Area, Alberta," *ibid.*, Paper 44-18 (report and map).
 J. F. HENDERSON, "Tay River Map-Area, Alberta," *ibid.*, Paper 44-26 (report and map).
 C. H. CRICKMAY, "Pouce Coupe-Peace River, Alberta and British Columbia," *ibid.*, Paper 44-31 (preliminary map).
 F. H. McLEARN, "Revision of the Palaeogeography of the Lower Cretaceous of the Western Interior of Canada," *Ibid.*, Paper 44-32 (report and figure).
 G. S. HUME, "Geology Promises More Oil Fields in Turner Valley Area," *Oil Weekly* (Houston, Texas, June 26, 1944).
 ———, "Cretaceous Formations in Canada," *ibid.* (December 25, 1944).

BRITISH COLUMBIA

- F. H. McLEARN AND J. F. HENDERSON, "Geology and Oil Prospects of Lone Mountain Area, B. C.," *Geol. Survey Canada, Paper 44-2* (report and map).

- J. SPIVAK, "Geology and Coal Deposits of Hasler Creek Area, B. C.," *ibid.*, Paper 44-7 (report and map).
- F. H. MCLEARN AND E. J. W. IRISH, "Some Coal Deposits of the Peace River Foothills, B. C.," *ibid.*, Paper 44-15.
- E. D. KINDLE, "Geological Reconnaissance along Fort Nelson, Liard and Beaver Rivers, Northeastern B. C. and Southeastern Yukon," *ibid.*, Paper 44-16 (report and map).
- H. H. BEACH AND J. SPIVAK, "Dunlevy-Portage Mountain Map-Area, B. C.," *ibid.*, Paper 44-19 (report and map).
- C. O. HAGE, "Geology Adjacent to the Alaska Highway, between Fort St. John and Fort Nelson, B. C.," *ibid.*, Paper 44-30 (report and map).

DEVELOPMENTS IN APPALACHIAN AREA IN 1944¹

APPALACHIAN GEOLOGICAL SOCIETY²

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ABSTRACT

NEW YORK. In the Oriskany gas-production area only 21 wells were completed or in progress as compared with 34 in 1943, but there was a much higher percentage of wildcat testing. The high point of the year was the discovery of the first new gas produced in 2 years with the Sylvania Corporation's 9 million-foot producer on the S. J. Frazier farm in Tuscarora Township, Steuben County. Two other important tests, one a wildcat in Wyoming County, the other a deepening of the original discovery well in the Woodhull field, furnished valuable subsurface information on formations below the Oriskany sand in this section of the state. A map showing location of Oriskany fields and wildcat tests and a table of wells drilled to or through the Oriskany sand are presented. Production figures for Oriskany gas are given. Leasing activities were very slow with the exception of the area surrounding the discovery well, and prospecting work was practically nil.

In the Medina gas belt bordering Lake Erie no new production of importance was found. Approximately 25 wells were drilled in the area in addition to the completions of independents and individuals in the metropolitan area of the Niagara frontier.

The oil-producing section of the state (Allegheny County and Cattaraugus County) for the third consecutive year completed approximately 1,500 wells in the water-flood area despite the war-time restrictions on materials and the definite man-power shortage. These completions were divided about half to water-intake wells and half to producers. Although recent drilling has been in progressively leaner areas and nearer to the edge of natural production limits, daily average production of crude oil dropped only 1,000 barrels in 1944 from the approximate 14,000 barrels daily average produced in 1943. An increase in wildcat drilling for shallow oil and gas production and in attempts to extend secondary recovery limits proved generally unsuccessful.

Of paramount importance to gas companies and consumers in the state were the deliveries of natural gas from the Southwest through the Tennessee Gas and Transmission Company's 24-inch main line and branch distribution systems.

PENNSYLVANIA. The number of wells completed in the shallow-gas territory of western Pennsylvania (Upper Devonian or higher) in 1944 was about the same as in 1943. Although several new gas pools were discovered, it is doubtful whether any of these will be of significant size. A considerable increase in drilling activity occurred in the oil fields, 3,375 new wells being completed in 1944 as compared with 2,617 in 1943, an increase of 29 per cent. Nearly half of the new wells were intake wells drilled in connection with water-flooding and air- and gas-repressuring projects. No oil pools were discovered. Oil production showed a further decline of 9 per cent during 1944. The Bradford field still accounted for 51 per cent of the total Pennsylvania-grade oil production of the Appalachian province.

Twelve deep wells (Onondaga or deeper) were completed in western Pennsylvania in 1944, which is the same number as in 1943. None found oil and only three gas. Of the latter, two are located in the southern extension of the Summit gas pool, Fayette County. The other, located in Beaver Township, Crawford County, in northwestern Pennsylvania, obtained a small flow of gas in the Oriskany sandstone, but an offset encountered salt water in the same sand. Of the dry holes, the Jessie C. Hockenberry No. 1 of the Manufacturers Light and Heat Company in Mercer Township, Butler County, bottomed in a quartzose sandstone underlying 520 feet of Lower Ordovician dolomite, reached a total depth of 10,096 feet. Salt water was encountered in the sandstone. It is now the deepest well in the Appalachian province and also the deepest well that has been drilled entirely with cable tools.

OHIO. The number of tests completed in 1944 increased over 1943 because of the slight stimulus in the Pennsylvania-grade area by the government subsidy of 75 cents per barrel, but the subsidy of 30 cents per barrel on all other grades caused no real increase in development. Production of Corning grade continued to decline. No important new fields were discovered, although thirteen new producing areas were opened, and certain areas tested by fifteen outlying producers will be ranked as new fields. Several important extensions to Clinton fields were developed.

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WEST VIRGINIA. Eight gas pools in the shallow sands were discovered in the southern part of the state in 1944. In the Oriskany sand, one pool was found in Kanawha County and an apparent small productive area discovered west of the Sandyville field in Jackson County.

In general, drilling for the year was in excess of that of 1943, but mostly in already proved but not closely drilled areas, this applying to both gas and oil. No oil discoveries of importance were made, and the drilling of inside leases was caused by the increasing demands of the markets.

KENTUCKY. Production of petroleum in Kentucky continued to increase during 1944, resulting in a total of 9½ million barrels, of which 17 per cent was contributed by that portion of Kentucky east of the Cincinnati arch, as compared with the total of 7 million barrels in 1943 of which 25 per cent was contributed by eastern Kentucky. This discrepancy is not due to a decrease in production in the eastern Kentucky fields but to the discovery of more new fields in western Kentucky.

In all, 1,135 wells were drilled in Kentucky, of which 480 were drilled in eastern Kentucky. Of this number 229 were gas wells, 122 oil wells, and 129 dry holes. No new fields were discovered but the production was kept to about normal by the reconditioning of old fields in Bath and Menifee counties, and the further development of the small new areas in Jackson and Elliott counties, which were first reported in 1943.

There was increased activity in Clinton and Cumberland counties due to the discovery of shallow oil of very high gravity which was proved to be short-lived. Several wells were drilled to the Knox dolomite in these counties, and one well drilled in Bath County encountered a little gas below the "Blue Lick" water in the upper portion of the Knox. During the year considerable interest was exhibited in the possibilities for deeper production and some leasing has been done with the view to testing the Cambrian sandstones on the Cincinnati arch.

TENNESSEE. Oil production east of the Cincinnati arch in Tennessee in 1944 was slightly more than 9,500 barrels, most of which came from the Mississippian limestone in Scott and Morgan counties. Small amounts of gas were produced in the Jamestown and Sunbright areas but were used for local consumption.

There were 16 completions in 1944, three of which were completed as commercial gas wells and one a small oil well. There was considerable activity in the northern Cumberland Plateau, particularly in Cumberland, Morgan, Scott and Fentress counties where several large blocks of acreage had been assembled.

Surface work is being carried on by at least four major companies and interest is focused on the pre-Mississippian production possibilities.

NEW YORK

ORISKANY AREA

STEBEN, ALLEGANY, CHEMUNG, SCHUYLER, WYOMING COUNTIES

Deep drilling for Oriskany gas reserves in the southwestern section of New York state suffered a severe drop from the 34 wells in operation or completed during the previous year. Only 18 wells were completed and 3 were in progress during 1944 but the percentage of wildcatting increased considerably. In 1944, 13 wildcat tests were drilled and one well was deepened as a wildcat test in comparison with 13 completed in 1943.

The high point of the year was the discovery of the first new reserves in 2 years, with the completion of the Sylvania Corporation's S. J. Frazier No. 1 in Tuscarora Township, Steuben County for 9 million cubic feet open flow and a rock pressure of 2,020 pounds per square inch. Although less than a mile south of the most northeasterly producing well in the Woodhull field, the location is south of a pronounced fault along which 3 unproductive wells had previously been completed. The key horizon, Tully limestone, was proved to be 219 feet lower, and the producing Oriskany sand 233 feet lower, than the well across the fault. The discovery can be attributed to reflection-seismograph work done in 1939, as there is no surface evidence of the structure. On one offset location more than a mile southwest a rig was being built as the year ended. Other offset locations,

which normally would have been numerous and rapid, have been held up by the most severe winter and heaviest fall of snow in 24 years.

Two other wells of importance tested sub-Oriskany formations never penetrated in previous deeper drilling in the area. One of these was the original discovery well of the Woodhull field, the Herrington No. 1, which is also the first Medina test drilled on producing Oriskany structure. The well was drilled deeper, from 3,968 feet to the total depth of 8,625 feet, by the New Penn Development Company and others, finding only a small amount of gas, 8 MCF, at 7,025-7,036 feet in the Red Medina, which later blew down, and, after shooting, finally flowed 5 MCF. A summary log of the deepening follows.

	<i>Feet</i>
Oriskany sandstone	3968-3980
Hard gray lime	-4330
Salt, shale, and lime	-5595
Gray and red, caving shales	-6245
Niagara limestone	-6270
Dark lime	-6335
Black shale	-6380
Gray and brown shale and lime	-6886
Medina sandstone (red)	-7066
Queenston shale (red and gray)	-7550
Gray sandy lime	-7743
Gray sandy shale	-7800
Sand (top Oswego sandstone, 7965)	-8625 T.D.

The other deep test is a wildcat location in the village of Arcade, Wyoming County, commenced late in 1943 by K. R. Wilson on his own land and shut down at 6,593 feet without commercial production as the year 1944 ended. The following partial, summary log is formulated through scout reports and the personal examination of samples (6,193 and deeper) by C. A. Hartnagel, recently retired State geologist of New York.

	<i>Feet</i>
Tully limestone	1750-1769
Onondaga limestone	2145-2274
(Oriskany reported as missing)	
Helderberg limestone	2274-2330
White lime	2330-2370
Salt	2760-2777
Niagara limestone	2925
Clinton sandstone	3118-3144
Red Medina sandstone	3290-3346
White Medina sandstone	3346-3365
Trenton limestone	5265-6193
(showing of gas at 6030; 25 M.C.F. at 6182)	
Little Falls dolomite	6193-6566
Potsdam sandstone	6566-6720
Potsdam or pre-Cambrian	6720-

Table I gives the pertinent data regarding other wildcat wells and tests drilled to or through the Oriskany horizon in 1944. Figure I shows the locations of wildcat tests completed or drilling during 1944 and the location of Oriskany fields in the state.

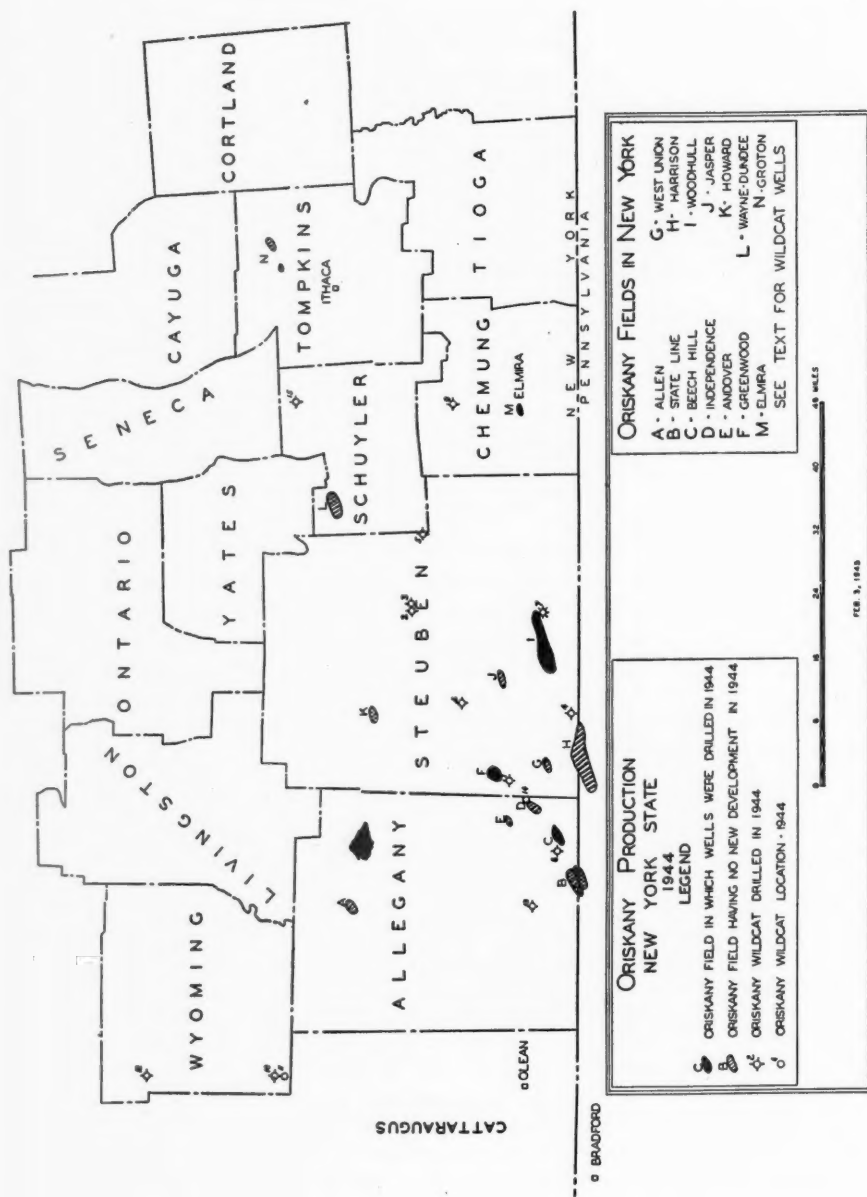


FIG. 1

TABLE I
DEEP DRILLING IN NEW YORK STATE IN 1944

County	Township	Company	Map No.	Well	Field	Class	Testing	Results	Completed
Steuben	Greenwood	BQ et al.	1	S. Murray 2	Greenwood	Wildcat	Oriskany ss.	SW 19 MCF	Abd. 4/6
"	"	AD		H. Warriner 2	"	Inside	"	SW	Abd. 2/7
"	"	NPD et al.		M. Hyland 1	Greenwood	Extension	"	SW	Abd. 5/4
"	Woodhull	NYSN		Herrington 1	Woodhull	Deepening	Oswego ss.	6 MCF (Med.)	10/26 Building rig
"	Canisteo	AG	6	R. Bliss 1	"	*Offset	Oriskany ss.	SW Show gas	Abd. 3/23
"	Bradford	AD	5	G. Coats 1	"	Wildcat	"	SW	Abd. 2/10
"	Bath	AD	3	H. Crisley 1	"	"	"	SW	Abd. 2/25
"	"	AD	3	H. Thompson 1	"	"	"	SW	Abd. 2/25
"	Troupsburg	AD	4	R. Lozier 2	"	"	"	Dry	Abd. 8/9
"	Tuscarora	SC	7	S. J. Frazier 1	"	"	"	9000 MCF	Abd. 11/28
"	Willing	Cunningham et al.	8	Wm. Burrows 1	"	"	"	SW Show gas	Abd. 3/30
"	Alma	AG et al.	13	K. Vossler 1	"	"	"	SW 117 MCF	Abd. 4/25
"	Independence	EGF	14	E. Clark Est. 1	Beach Hill	Extension	"	SW 2 MCF	Abd. 9/25
"	"	"	14	E. Clark Est. 1	"	Wildcat	"	"	Drilling, 4,500 ft.
Chemung	Veteran	DYM	9	A. M. Beebe 2	"	"	"	Dry	Abd. 2/17
"	Elmira	Updegraf	15	G. Rickard 1	"	Extension	"	SW	Abd. 3/29
Schuyler	Hector	BQ	11	T. Allen	Elmira	Wildcat	Sub Trenton ls.	5 MCF (Med.)	Abd. 6/1
Wyoming	Arcade	K. R. Wilson	10	K. R. Wilson 1	"	"	Medina ss.	10 MCF	Shut down, 6,503 ft.
"	Sheldon	Liederbach et al.	12	A. Bigelow 1	"	"	Oriskany ss.	"	10/27
"	"	"		F. Armbrust 1	"	"	"	"	4/19

* Offset to Frazier discovery well in Tuscarora Township.

BQ—Belmont Quadrangle Drilling Corp.
 AD—Appalachian Development Corp.
 NPD—New Penn Development Co.
 NYSN—New York State Natural Gas Corp.

AG—Allegheny Gas Co.
 SC—The Sylvania Corp.
 EGF—Empire Gas & Fuel Co., Ltd.
 DYM—Dusenberry, Yahn, Messer.

All Oriskany fields shown in Figure I produced gas in 1944 except the Andover field which was drowned out in 1940. The Groton field, discovered in 1942, had its first production during the year and the Allen field quit producing gas into lines late in the year. Total production of Oriskany gas from all fields for 1944 amounted to approximately 3,143,000 MCF, a drop of $1\frac{1}{4}$ billion feet from the previous year.

Of growing importance in Oriskany gas developments in New York state is the expanding use of depleted fields for storage purposes. Two fields, Greenwood and Wayne-Dundee, and one isolated well, the Gilbert, in Wirt Township, Allegany County, passed 1,390,642 MCF of gas into and out of storage with a surplus of 26,860 MCF left in.

With very few exceptions leasing operations were confined to surrenders. There were no large blocks taken and no great activity other than the developments around the Tuscarora Township discovery late in the year.

Geological or geophysical work in new areas or in the reworking of old areas was practically dormant.

MEDINA AREA

CHAUTAUQUA, CATTARAUGUS, ERIE, NIAGARA COUNTIES

No new production of consequence was found in the Medina gas belt bordering Lake Erie. Independents drilled an unaccounted-for number of wells in and around the metropolitan area of Buffalo and the Niagara frontier. Of the 23 completions listed by the Iroquois Gas Corporation and the Republic Light, Heat and Power Company, 14 were in Erie County in Boston, Collins, and North Collins townships. Three dry holes were completed in Otto and East Otto townships, Cattaraugus County. The majority of drilling was done in storage areas where, even within production limits, half of the completions were dry holes.

OIL-PRODUCING AREA

ALLEGANY, CATTARAUGUS, STEUBEN COUNTIES

For the third consecutive year the oil-producing area of southwestern New York completed about 1,500 wells in the secondary-recovery, water-flood program. The total completions in the Allegany field (Allegany and Steuben counties) were 1,238, only 7 wells under the number for 1943. The Cattaraugus County side of the Bradford (Pennsylvania) field had an estimated 250 wells drilled in 1944. Completions were divided about half to water-intake wells and half to producing wells. The maintenance of this drilling program was accomplished despite the war-time restrictions on materials and the acute oil-field man-power shortage.

Although recent developments for new flood production have been forced into areas where the indicated secondary recovery is lower than the richer areas developed in past years, daily average production in 1944 dropped off only 827 barrels from the previous year's average. Of the 13,075 barrels daily average pro-

duction in 1944, 10,118 barrels per day came from the Allegany field, 2,957 barrels from Cattaraugus County fields.

The decided tendency toward wildcat drilling for new shallow (Upper Devonian) oil and gas production, and step-out locations to extend the limits of possible water-flood productive acreage, which was first noticed in 1943, continued at an increased rate in 1944. Very little success attended these efforts and no new pro-

TABLE II
RESULTS OF SHALLOW TEST WELLS IN NEW YORK STATE IN 1944

County	Township	Wells Completed	Average Depths (Feet)	Extensions	Wildcats	Gas	Oil	Abandoned
Cattaraugus	Carrollton	12	800-1800	8	4		8	4
"	Great Valley	1	1760		1			1
"	South Valley		1600		1			Drilling
"	Machias	1	1553		1			1
"	Allegany	1	1753	1			1	
"	Olean	4	1438-1917	3	1			1
Allegany	Ward	2	512-1007		2		3	2
"	Amity	7	?	5 Inside	2		5	2
"	Alma	1	?	1 Core test				1
"	Genesee	1	?		1			1
"	Wellsville	2	1000		2	1		1
"	Bolivar	1	1388		1			1
"	Angelica	1	?					
"	Willing	3	1500		3	3		

duction was found. Table II gives a summary of results of some of the test drilling in 1944. The majority of these wells are located within 10 miles of the New York-Pennsylvania state line in Allegany and Cattaraugus counties.

Leasing activity has been localized around the wildcat tests where locations have been made on the basis of trends and old drilling rather than any structural, stratigraphic, or geophysical evidence.

Of paramount importance to gas companies and consumers in New York is the bolstering of rapidly decreasing reserves by gas deliveries from southwestern fields. More than 250 million cubic feet per day was available late in the year in the Appalachian area at the West Virginia terminus of the Tennessee Gas and Transmission Company's 24-inch line from Monroe, Louisiana, and Corpus Christi, Texas. Part of this daily delivery found its way into New York state through the lines of the Home Gas Company and the New York State Natural Gas Corporation.

PENNSYLVANIA³

A slight increase in drilling activity occurred in the shallow-gas territory of western Pennsylvania (Upper Devonian or higher) during 1944 and a considerable increase in the oil fields. The number of deep tests (Middle Devonian or deeper) completed was the same as in 1943 and these did not open any new reserves of natural gas. Thus far, no commercial oil has been encountered in sands below the Upper Devonian in Pennsylvania.

³ Published by permission of the state geologist of Pennsylvania. In connection with the preparation of this review, the writer wishes to acknowledge the cooperation of Parke A. Dickey, F. H. Finn, John T. Galey, and D. T. Secor who contributed part of the data.

SHALLOW-SAND DEVELOPMENTS

GAS

During 1944, 855 wells were completed in the shallow-sand gas territory of western Pennsylvania, as compared with 770 in 1943, an increase of 11 per cent. Of the shallow wells drilled for gas, 73 per cent were producers and 27 per cent were dry. The 625 new gas wells had a total initial open-flow capacity of 124,684,000 cubic feet of gas per day, as compared with the total initial open-flow capacity of 147,282,000 cubic feet of the 579 new gas wells completed in 1943.

Southwestern Pennsylvania.—Shallow-well completions in southwestern Pennsylvania are shown in Table III. The 338 new gas wells had a total initial open-flow

TABLE III
SHALLOW-WELL COMPLETIONS IN SOUTHWESTERN PENNSYLVANIA IN 1944

County	Completions		Gas			Oil			Dry	
	Number of Wells	Average Total Depth (Feet)	Number of Wells	Average Initial Open Flow M.C.F. per Day	Average Total Depth (Feet)	Number of Wells	Average Initial Production Barrels per Day	Average Total Depth (Feet)	Number of Wells	Average Total Depth (Feet)
Allegheny	36	2,863	27	304	2,816	1	5	1,700	8	3,167
Armstrong	102	2,876	94	122	2,874	0	—	—	8	2,894
Beaver	3	1,094	1	114	1,163	1	2	1,060	1	1,059
Butler	31	1,074	9	36	2,060	13	2	1,527	9	1,498
Fayette	69	2,701	45	495	2,698	1	15	1,873	23	2,745
Greene	86	2,886	67	298	2,825	0	—	—	19	3,099
Indiana	32	3,013	20	68	3,143	0	—	—	12	2,797
Lawrence	3	744	1	20	748	0	—	—	2	741
Washington	52	2,436	38*	370	2,434	3	11	1,815	11	2,605
Westmoreland	50	3,168	36	192	3,282	0	—	—	23	2,990
Total	473	2,745	338	251	2,813	19	4.2	1,576	116	2,737

* Includes 2 gas storage wells.

capacity of 84,784,000 cubic feet of gas per day. No new gas pools of significant size were discovered in southwestern Pennsylvania during 1944.

Northern and central districts.—A summary of activities in the shallow-gas territory of the northern and central districts during 1944 is given in Table IV. The 287 new gas wells had a total initial open-flow capacity of 39,900,000 cubic feet of gas per day. The large average initial open-flow capacities of the wells in Clearfield and Warren counties, shown in Table IV, are due to the fact that the averages in these counties have been distorted by the completion of a few exceptionally large wells.

A Haskell sand gas pool was opened in Hamlin Township in southwestern McKean County early in 1944. By the end of the year 9 producing wells and two dry holes had been drilled, proving an area of about 275 acres without defining the limits of the pool. The depth of the sand ranges from 2,470 to 2,530 feet. The wells have an average initial open-flow capacity of 160,000 cubic feet per day, individual wells ranging from 60,000 cubic feet to 438,000 cubic feet. Initial reservoir pressure was 800 pounds per square inch. During the latter part of the year, the pool was producing about 10,000,000 cubic feet of gas per month.

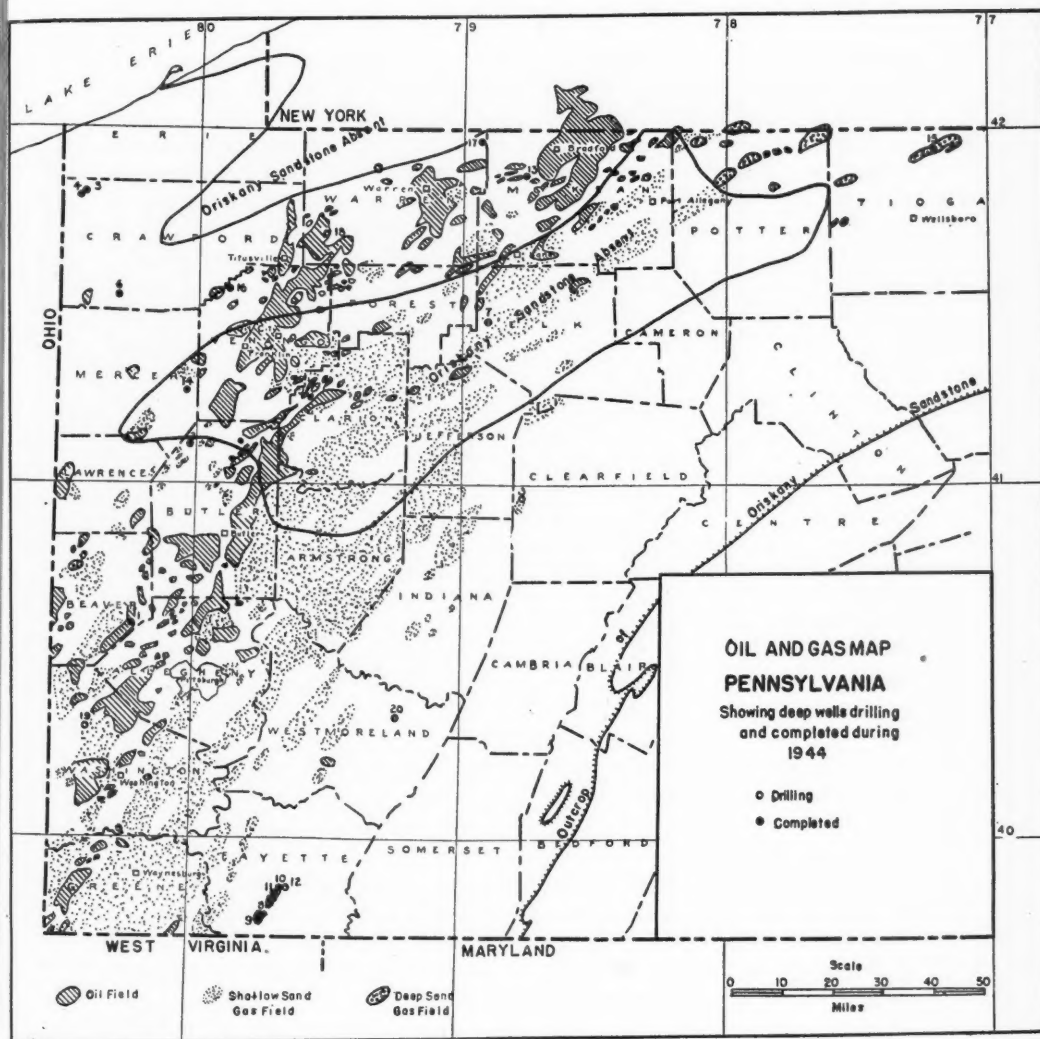


FIG. 2

Three shallow gas wells were completed on the east side of the Allegheny River between Kinzua and Corydon in northeastern Warren County during the summer of 1944 that may lead to the development of a Clarendon sand gas pool of some magnitude as the maximum distance between the wells is 4,600 feet and no wells had been drilled previously in the immediate vicinity. Depth of sand ranges from 650 to 720 feet. The wells had initial open-flow capacities varying from 54,000 to 1,000,000 cubic feet per day. Reservoir pressures reported vary from 260 to 475 pounds per square inch. As the discovery is located a considerable

TABLE IV
SHALLOW-WELL COMPLETIONS IN GAS FIELDS IN NORTHERN AND CENTRAL PENNSYLVANIA IN 1944

County	Completions		Gas			Dry	
	Number of Wells	Average Total Depth (Feet)	Number of Wells	Average Initial Open Flow M.C.F. per Day	Average Total Depth (Feet)	Number of Wells	Average Total Depth (Feet)
Clarion	79	2,308	62	62	2,250	17	2,523
Clearfield	8	3,086	3	866	2,799	5	3,271
Elk	83	2,420	58	107	2,585	25	2,537
Forest	29	1,885	20	165	2,010	9	1,587
Jefferson	96	2,840	72	143	2,767	24	3,059
McKean	64	2,298	45	94	2,283	19	2,334
Mercer	13	935	8	57	764	5	1,207
Venango	7	2,021	7	63	2,021	0	—
Warren	22	1,786	12	545	1,367	10	2,289
Total	401	2,364	287	139	2,358	114	2,378

distance north of any present producing gas fields, no pipe-line connection had been made by the end of the year.

OIL

A considerable increase in drilling activity occurred in the oil fields of western Pennsylvania, 3,375 new wells being completed in 1944, as compared with 2,617 in 1943, an increase of 29 per cent. Almost all of the drilling was done in connection with secondary-recovery operations, either water-flooding or air- and gas-repressuring projects. No oil pools were discovered. Oil production showed a further decline of 10 per cent during 1944.

In the Bradford field, 2,436 new wells were drilled, about half of which were water-intake wells, as compared with 2,118 in 1943, an increase of 15 per cent. Oil production in this field, about 86 per cent of whose area lies in Pennsylvania, dropped from 13,684,186 barrels in 1943 to 12,162,522 barrels in 1944, or 11 per cent. The field accounted for 52 per cent of the total Pennsylvania-grade crude oil production of the Appalachian province in 1944.

The number of new wells completed in the central and southwestern districts

of Pennsylvania in 1944 was 939, as compared with 499 in 1943, an increase of 88 per cent. A large part of this increased activity was due to the extensive development campaign conducted by the Northern Ordnance Company of Minneapolis, Minnesota, in the Venango district. The company, a new-comer in the Pennsylvania oil fields, and its affiliates purchased 17,000 acres of oil lands in Venango and Warren counties, on which are located 1,500 wells with an annual production of about 150,000 barrels. The company has embarked on an intensive secondary-recovery program in connection with which 180 air-input and 230 oil-producing wells were drilled during 1944. The daily average production in the central and southwestern districts of Pennsylvania declined from 9,154 barrels in 1943 to 8,468 barrels in 1944, or 7.5 per cent. The total production in 1944 of these two districts approximated 3,099,300 barrels, or 13.2 per cent of the total Pennsylvania-grade production.

The experimental water-flooding project undertaken by the Forest Oil Corporation of Bradford in the Venango Second sand in the Clintonville pool in southwestern Venango County in 1943 has not been successful. The company practically suspended operations in the test in 1944. It was found that in many places old and imperfectly plugged wells had allowed water access to the oil sand. In some cases, the water was found (by electrical tests) in the upper few feet of sand, presumably originally gas-bearing, while in others it was all through the sand body. The Quaker State Oil Refining Corporation purchased the Clintonville properties, along with other Forest interests in Pennsylvania in September, and is starting to drill the central producing wells. Two had been drilled by the end of the year and were producing a few barrels of oil daily together with considerable amounts of water.

Work on the experimental mine shaft with horizontal holes into the Venango First sand in the old Franklin heavy-oil pool at Franklin, Venango County, continued throughout the year, although results were disappointing. Two holes were drilled a distance of about 2,300 feet radially from the shaft and were shot. Another pair was drilled 1,000 feet and a third pair, 700 feet from the shaft. These holes have not been shot. Drilling is continuing, but slowly because of man-power and equipment shortages.

The Pennsylvania Grade Crude Oil Association started a rather ambitious program of research in production fundamentals and technology during 1944. Several well qualified engineers have been employed and a laboratory is to be equipped in Bradford. The group will investigate, in cooperation with the American Petroleum Institute, the possibilities of bacteria as an agent in oil recovery, and undertake other studies of both a fundamental and an applied nature.

In cooperation with the Pennsylvania State College, the research group worked out a method of measuring water-intake rates in different strata. The method involves injecting salt water down a string of tubing and fresh water down the annulus, determining the location of the interface electrically and measuring the input rates above and below the interface.

TABLE V
DEEP TESTS COMPLETED AND DRILLING IN WESTERN PENNSYLVANIA IN 1944
(Depths are in feet)

Map No.	County Township	Well	Company	Elevation from Sea Level	Borehole	Tully	Top of Onondaga	Oriskany	Lockport	Medina	Top of Trenton	Top of Beekmantown	Top of Gas St. ?	Total Depth	Date Completed	Results
1	Beaver Harmony	Spang Chalfant 1	Natl. Supply Co.	767	1050-1081	5063-5068	5315-	5471-						5,484	4- 7-44	Salt water from Oriskany rose 1500 feet in 12 hours
2	Butler Mercer	Jessie C. Hockemberry 1	Mfgs. Light & Heat Co.	7306	728-741	448-452	4702-	4838-4841	5035-5085	6433-6633	8812	9553	10,074	10,096	11-19-44	Showing of gas at 9150-9210 and 9746-9771. Salt water at 10,096 feet
3	Clearfield Bell	Alice Irwin 10	F. C. Deemer	1961												Drilling at 3554 feet
4	Crawford Beaver	Alfa Cosadd 1	Appalachian Dev. Corp.	1027			2142-	2388-2594						2,404	10- 5-44	100 MCF per day open flow after casing. 650 psi.; Oriskany
5	Crawford Beaver	Fred Walton 1	Appalachian Dev. Corp.	1006			2144	2390-						2,427	12- 4-44	64 balters salt water. Showing of oil, Oriskany
6	Crawford E. Fallowfield	Ellen Calvin 1	Sylvania Corp.	1342		3083-3127	3242	3431-3448	4100-4421					4,644	8-20-44	Hole full salt water from Oriskany. Showing gas at 4398-4421, salt water 4421
7	Elk Highland Georges	Warrant 3653 1	Pennsylvania Gas Co.	1572		5141-5177	5545	Absent								Drilling deeper
8	Fayette Georges	Wm. R. Barton 4	Greensboro Gas Co.	2370		6425-6505	6688-6702	7340-7407						7,510	1-27-44	1,250 MCF—I.O.F. from Onondaga chert
9	Fayette Georges	Wm. R. Barton 5	Greensboro Gas Co.	2190		6118-6194	6705-6709	7073-7209						7,242	12- 8-44	600 MCF—I.O.F. Oriskany 7073-7076
10	Fayette S. Union	Leo F. Heyn 1	New Penn Dev. Corp. & Wm. E. Snee	2316		6021-6100	6572-6583	6777-6848						8,450	2-24-44	Deepened from 7508. No additional gas

TABLE V—Continued

[illegible]

DEEP-SAND DEVELOPMENTS

The results of deep drilling in western Pennsylvania during 1944 are summarized in Table V. Of the twelve wells completed, three encountered commercial volumes of gas, one was drilled for gas storage purposes, and eight were dry. Two of the successful wells are located in the southern extension of the Summit gas pool in Fayette County. The two wells deepened in the Summit pool did not encounter any additional quantities of gas. One of these, the Heyn No. 1, was bottomed in anhydrite and salt beds in the lower part of the Salina formation. Drilling was stopped by caving encountered in these beds.

The Alfa Cozadd well in the northwestern part of Crawford County had an initial open-flow capacity of 190,000 cubic feet of gas per day from the Oriskany sandstone after casing and a reservoir pressure of 650 pounds per square inch. A number of wells had been drilled to the Oriskany in the vicinity in previous years. All of these encountered salt water in the sand and some had good showings of both oil and gas. Elevations on top of the sand suggested the possible presence of a dome of moderate relief and size at the site of the Cozadd well. This was verified by drilling, but a later offset well, which was lower on structure and encountered salt water, indicated that the productive area can not be very large. With a sand thickness of only 6 to 9 feet, therefore, no significant reserve of gas was opened by the discovery. The E. A. Williams well No. 1 in the northeastern corner of Warren County represents another unsuccessful attempt to locate a stratigraphic trap-type gas pool in the Oriskany sandstone which feathers out updip northwest.

Of the dry holes, the Jessie C. Hockenberry No. 1 of the Manufacturers Light and Heat Company in Mercer Township, northwestern Butler County, was the most interesting, both from a stratigraphic standpoint and from the depth attained with cable tools. The well started a short distance above the Vanport limestone in the Allegheny group of the Pennsylvanian system and was bottomed in a quartzose sandstone underlying 520 feet of Lower Ordovician dolomite, probably Beekmantown in age. Salt water was encountered in the sandstone. Acidizing did not increase the small flow of gas encountered in the dolomite. The well reached a total depth of 10,096 feet and is now the deepest well in the Appalachian province and also the deepest well that has been drilled entirely with cable tools.

BIBLIOGRAPHY

Special Bulletin No. 1, Pennsylvania Geological Survey, Fourth Series, on the "Oil-Bearing Sands in Southwestern Pennsylvania," a preliminary report prepared by L. S. Matteson and D. A. Busch, was the most informative publication relating to the geology of the oil and gas fields of western Pennsylvania to appear in 1944. This is a folio of 55 maps and sections, 12 by 15 inches, accompanied by 16 folio-size pages of text and descriptive matter and selected well records. It shows where the several sands of the Venango group from the Gantz and Fifty-

foot to and including the Fifth have been productive of oil and gas in southwestern Pennsylvania and where they play out or are unproductive. The area covered includes most of Greene and Washington counties, the southwestern part of Allegheny County, and a narrow strip along the southern border of Beaver County.

OHIO

The number of tests completed in Ohio during the year increased to some extent over the previous year due to a slight stimulus given prospecting in the Pennsylvania-grade area by the Government subsidy of 75 cents a barrel. However, the subsidy of 35 cents a barrel granted on all other grades caused no appreciable increase in development, and production of Corning grade continued to decline.

No important new fields were discovered although thirteen new producing areas were opened, and certain areas tested by fifteen outlying producers will undoubtedly be ranked as new fields. Several important extensions to Clinton fields were developed. Notable among these were Dover Township, Tuscarawas County, approximately 1200 acres, Clinton gas; La Grange and Huntington townships, Lorain County, approximately 1500 acres, Clinton gas; Bath Township, Summit County, 750 acres, Oriskany gas.

The three largest gas wells all of which produced from the Clinton sand were as follows: Robinson *et al.* Kapp No. 5, Sec. 16, Lake Township, Ashland County, 12,000,000 cubic feet, total depth 2975 feet; Ohio Fuel Gas Company's Parker No. 1, Tract 12, Huntington Township, Lorain County, 12,000,000 cubic feet, total depth 2449 feet; Harmon *et al.* Griggs No. 2, Tract 7, same township, 9,800,000 cubic feet, total depth 2460 feet.

Only three oil wells were rated at more than 100 barrels initially. These produced from the Clinton sand in Clayton Township, Perry County. They were the Pure Oil Company's Wilson No. 4, Sec. 12, 135 barrels, total depth 3220 feet; the Preston Oil Company's Loveberry No. 1, Sec. 5, 115 barrels, total depth 3106 feet; and the Preston Oil Company's Yarger No. 1, Sec. 5, 105 barrels, total depth 3182 feet.

The most noteworthy completion in the Oriskany sand was The Ohio Oil Company's Barnett No. 1, Sec. 14, Knox Township, Columbiana County, which gauged 6,000,000 cubic feet after a shot.

The deepest test in the state was The Texas Company's Mizer No. 1, Sec. 32, Stock Township, Harrison County, which tested the Clinton and was abandoned at the depth of 6301 feet. During September this company also started the first deep rotary well to be drilled in Ohio.

Completions during the year are summarized by sands and counties in the following tables.

TABLE VI
WELLS DRILLED DURING 1944 IN OHIO

<i>Sand</i>	<i>Oil Wells</i>		<i>Gas Wells</i>		<i>Number of Dry Holes</i>	<i>Total Number Drilled</i>
	<i>Number of Wells</i>	<i>Average Initial Daily per Well (Barrels)</i>	<i>Number of Wells</i>	<i>Average Initial Daily per Well (M.C.F.)</i>		
Shallow	36	18	33	308	47	116
Berea	53	11	125	187	75	253
Ohio shale			6	89	5	11
Oriskany	1	4	20	908	13	34
Newburg	2	21	3	504	0	5
Clinton	67	36	285	1,085	245	597
Trenton	10	7	6	4	9	25
Sub-Trenton					2	2
Total	169	23	478	769	396	1,043

TABLE VII
COMPLETIONS IN OHIO IN 1944

<i>County</i>	<i>Oil Wells</i>	<i>Gas Wells</i>	<i>Dry Holes</i>	<i>Total</i>
Ashland	8	13	21	42
Athens	9	25	14	48
Carroll			1	1
Columbiana	4	6	8	18
Coshocton	7	4	16	27
Cuyahoga		6	5	11
Darke		1		1
Fairfield	1	6	6	13
Fulton		1		1
Gallia		12	5	17
Geauga			3	3
Guernsey	2	9	12	23
Harrison			1	1
Henry	1	1		2
Hocking	3	4	8	15
Holmes	3	28	22	53
Jackson			4	4
Jefferson	1	3	1	5
Knox	5	4	11	20
Lake		3	1	4
Lawrence		6	3	9
Licking	14	4	4	22
Logan		2		2
Lorain		35	27	62
Mahoning			2	2
Medina	4	34	24	62
Meigs	8	16	6	30
Mercer	4	2		6
Monroe	13	21	22	56
Morgan	1	26	21	48
Muskingum	16	43	35	94
Noble	6	28	19	53
Perry	40	23	29	92
Preble			1	1
Putnam			1	1
Richland			2	2

TABLE VII—Continued

County	Oil Wells	Gas Wells	Dry Holes	Total
Seneca			1	1
Stark		50	4	54
Summit	1	17	12	30
Tuscarawas		19	11	30
Vinton			1	1
Washington	12	19	18	49
Wayne	1	7	8	16
Wood	5		6	11
Total	169	478	396	1043

WEST VIRGINIA

In the shallow sand areas of the state, upward from the top of the Corniferous limestone, eight pool discoveries were made. These were all in southern counties, Nicholas, Boone, Wyoming and Raleigh, and in the Maxton, Ravencliff, Big Lime, Big Injun, and Berea sands. New productive areas opened will not be great, as in this general edge area erratic porosity seems to account for accumulation.

In the Oriskany sand, and based on the completion of one well, a new pool had been discovered in Kanawha County in the Blue Creek vicinity, and the pool will probably be named for this stream. In addition a new productive area, again with only one well, was opened in Jackson County 3 miles west of the old production. This is evidently an outlying area of porosity and can not be of great size as it is practically outlined by dry holes.

The Oil and Gas Division of the State Department of Mines reports 1944 drilling activities, with data not complete, as follows.

Total permits issued	1,019
Total new wells completed	751
Old wells drilled deeper	57
Gas wells	584
Oil wells	56
Combination oil and gas wells	10
Dry holes	518

Of the total new wells completed and old wells drilled deeper (808), 173 did not report initial daily open-flow volumes. For the balance, initial gas open flow was 233,958,000 cubic feet, and initial oil volume was 445 barrels daily.

There were reported for abandonment during the year 666 wells. Gas wells actually abandoned totaled 360, oil wells 145, and combination oil and gas wells 10, a grand total of 515 wells.

A description of the drilling below the top of the Corniferous limestone will follow. All other operations are above that level, the major producing formations being the Devonian shale, the Berea and Big Injun sands, and the Big Lime (Greenbrier).

These figures indicate somewhat greater drilling operations than in 1943, but the major part of it was on inside and proved acreage, this proceeding being

necessary by reason of the great demand of the markets. Drilling for oil was routine and confined to inside operations entirely with no new pool discoveries.

In the Oriskany sand producing areas of Kanawha and Jackson counties, 18 gas wells were completed, with seven wells drilling at the year's end. Of the gas wells, 17 were edge operations and the total open flow developed amounted to 23,079,000 cubic feet, with about half of this coming from two wells. This, of course, indicated the passing of these areas as major contributors to the market. The eighteenth well has already been mentioned and, while it definitely opens a new area, it will probably be restricted to a few thousands acres, this opinion being based on the results of past drilling not too far away.

In addition one small Oriskany sand gas well was completed in Lewis County, its open flow being approximately 100,000 cubic feet.

In all, there were 23 Oriskany sand dry holes drilled, 8 in Jackson County, 4 in Wood, 2 in Boone, 2 in Kanawha, 2 in Hancock, and one each in Lincoln, Raleigh, Putnam, Tucker and Preston counties. Two dry holes (included in the 23) were drilled through the Clinton sand—one in Boone County and one in Jackson County. Plenty of Clinton sand body was found in both tests, but the one in Jackson County had nothing in the way of structure to recommend it.

Oriskany sand gas production for the year totaled about 45 billion cubic feet, just half of the 1943 total and slightly more than one-third of the 1942 total, the high for the fields.

Two deep tests, active at the end of the year, and of especial interest, are those in Tucker and Pocahontas counties. Both are far east of developments and both are on surface structures of considerable size. The latter starts at the horizon of the Clinton sand and will explore formations not yet drilled through in the state.

In general, it may be said that operations for the year have been successful. New edge areas have been opened in the shallow sands, and one discovery, of as yet unknown importance, in the Oriskany sand.

EASTERN KENTUCKY

Production of oil in Kentucky passed its all-time peak during 1944 with 9,496,985 barrels being contributed. The delivery of natural gas, especially from eastern Kentucky, was maintained and possibly exceeded the highest deliveries of the past. Of the total oil production 17 per cent was contributed by that portion of Kentucky east of the Cincinnati arch, as compared with the total of 7,010,776 barrels contributed in 1943 of which 25 per cent was from eastern Kentucky. This discrepancy is due to the discovery of more new fields in western Kentucky rather than to a decrease in production in the eastern fields where the average has been maintained by reconditioning and secondary recovery of oil fields and further development of new pools reported for the first time in 1943.

The Big Sandy gas field, which is located in Floyd, Knott, Pike, Martin, southern Johnson, and southeastern Magoffin counties, still holds the spotlight for eastern Kentucky development. In this area, which encloses 2,000 square

miles of proved gas production, 217 gas wells, 33 dry holes, and 12 oil wells were completed during 1944, making a total of 3,105 gas wells, 397 dry holes and 112 oil wells drilled. Gas from the Devonian-Mississippian black shale is still responsible for 57.3 per cent of gas wells drilled.

The only other gas of importance developed in eastern Kentucky during 1944 were 9 wells drilled in the McKee gas field, Jackson County, 6 in the Oneida field, Clay County, and 1 in the Artemus gas field, Knox County.

One of the largest potential gas areas in eastern Kentucky as yet untested lies in Leslie and Clay counties. During 1944 large blocks of leases were acquired and a well will be drilled near Hyden, the county seat of Leslie County, in the near future. This well will probably test the Silurian, and perhaps deeper, formations and will be watched by the gas operators with considerable interest.

There were no new oil pools discovered in eastern Kentucky during 1944, and the 400 barrels per day increase in production was due largely to the reconditioning and development of old producing areas by the Ashland Oil and Refining Company.

On and around the Burke dome in Elliott County, 12 new oil-producing wells and 4 dry holes were drilled during 1944, bringing the total production up to approximately 100 barrels per day. This new field is only delivering 50 barrels per day as all equipment has not yet been installed. In Menifee County the heavy Ragland-type oil production was increased to 200 barrels per day with several wells drilled in the Indian Creek area. The accumulation here is in the Lockport (Corniferous of the driller). Five dry holes were drilled outside of this area.

In the Mummie pool, Jackson County, 15 oil wells and 1 dry hole were drilled in 1944. These have been connected by pipe line and are delivering more than 100 barrels per day.

The other new oil production comes from 10 wells drilled in the Big Sandy gas field, 3 being in the old Wolfe Creek Maxon oil pool. Cuttings saved from five wells, drilled through the Silurian section in Pike and Floyd counties, made it possible to correlate definitely the so-called "Corniferous" with that higher on the Cincinnati arch and with the standard section. This study indicated that in the area of thick "Corniferous" it includes Onondaga, Oriskany, Helderberg, Cayuga, and Lockport, whereas only the Lockport is present on the east flank of the Cincinnati arch where so much petroleum has been produced in the past.

There was increased activity in Clinton and Cumberland counties due to the discovery of shallow oil of very high gravity in a lower Mississippian limestone, about 70 feet above the Chattanooga shale. Other wells were drilled in the area, encountering production at 190 to 240 feet. The initial production was 20 to 200 barrels per day and the average about 60 barrels per day. The oil is paraffine, base, and very light green. These wells, however, did not hold up and the first was abandoned about 3 months after it was drilled. The production from the Desda field in Clinton County is derived from an Ordovician limestone called "Granville" by the drillers and possibly is accumulation in a reef-like structure in the Cynthiana (upper Trenton).

Several wells were drilled to the Knox dolomite in Clinton and Cumberland counties. A Knox test was drilled in Casey County and another is being drilled in Lincoln County. There has been much leasing, a little drilling of shallow wells, and much discussion of deep wells on the south flank of the Jessamine dome of the Cincinnati arch in Lincoln, Casey, Boyle, and Marion counties. Small wells have been developed in the Brassfield limestone which locally is preserved across the arch and is overlain directly by the Chattanooga shale. It is in that area that faulting, some of which is possibly late Devonian, has been responsible for the preservation of Devonian limestone which elsewhere on the arch is absent.

Five wells were drilled in Rockcastle County during 1944. The plan was to test the Lockport but as it is absent there most of the wells were deepened to the upper Ordovician.

TENNESSEE EAST OF CINCINNATI ARCH*

The production of crude oil east of the Cincinnati arch in Tennessee during 1944 was slightly more than 9,500 barrels. Approximately 8,000 barrels were produced from the Mississippian limestone in Scott and Morgan counties in the northern Cumberland Plateau. Some half dozen scattered wells in Clay, Pickett and Fentress counties, on the eastern Highland Rim, accounted for about 1,500 barrels. This production is from rocks of Ordovician age ranging in depth from 500 to approximately 1,000 feet. Some amounts of gas were produced for local consumption in the Jamestown and Sunbright areas.

There were 16 wells spudded in during 1944 east of the Cincinnati arch, one of which was drilling on December 31, 1944. There were 16 completions, which totaled 19,615 feet; one was a small oil producer, later abandoned, and three are considered as commercial gas wells although only one is on the line.

The most active area in the state during the year was the northern Cumberland Plateau, especially in Cumberland, Morgan, Scott and Fentress counties. Several blocks, aggregating more than 500,000 acres, have been assembled and leasing was continuing in the early part of 1945. Surface work has been or is being carried on by at least four of the major companies. Interest has been focused on the possibilities of pre-Mississippian production. One deep Ordovician test has been started in Cumberland County on a well defined surface structure. The northern Cumberland Plateau area promises to attract considerable attention during 1945.

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DEVELOPMENTS IN EASTERN INTERIOR BASIN IN 1944¹

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ABSTRACT

Drilling in the Eastern Interior basin increased 20 per cent and oil production decreased 4.4 per cent in 1944. The increase in drilling followed the change in the well-spacing rules in Supplementary Order No. 5, dated April 19, 1944, to Petroleum Administrative Order No. 11. This permitted the drilling of 1 well in 10 acres to any formation above the base of the Aux Vases formation regardless of depth, and 1 well in 20 acres to any formation between the base of the Aux Vases and the base of the Fredonia. There was little deep testing in 1944.

Production in Kentucky of 9,621,000 barrels of oil in 1944 was the highest annual production yet recorded for that state, an increase of 22 per cent over that of 1943. Illinois production in 1944 was down 6 per cent from that of 1943 and Indiana production was down 4 per cent.

Drilling in 1945 is expected to continue at nearly the same rate as in 1944, with continued discovery of new pools and extensions.

INTRODUCTION

Drilling in the Eastern Interior basin in 1944 increased by one-fifth partly as a result of the relaxation of the federal Government's well-spacing restrictions effective on April 19, 1944. Forty-eight new pools were discovered, all of them small. Total production in 1944 was approximately 90 million barrels which amounted to 5.4 per cent of the total for the United States.

The Eastern Interior basin (Fig. 1) comprises about four-fifths of Illinois plus the adjoining parts of Indiana and Kentucky and has a total area of approximately 50,000 square miles. Oil production is largely confined to the southern half of the basin.

DEVELOPMENT

Approximately 2,967 wells were drilled for oil and gas in the Eastern Interior basin in 1944 as compared with 2,473 in 1943, an increase of 20 per cent. The following table shows the distribution by states.

	Number of Completed Wells (Excluding water and gas input wells, salt-water disposal wells, and old wells worked over)	
	1943	1944
Illinois	1792	1991
Southwestern Indiana	465	276
Western Kentucky	216	700*
	2473	2967

* Approximate.

The total oil production from the Eastern Interior basin in 1944 amounted to 90,400,000 barrels as compared with 94,528,000 barrels in 1943, a decrease of 4.4 per cent. Illinois produced 77,413,000 barrels of which it is estimated 90 per cent was from Mississippian strata, 5 per cent was from Devonian strata, 3.5 per cent

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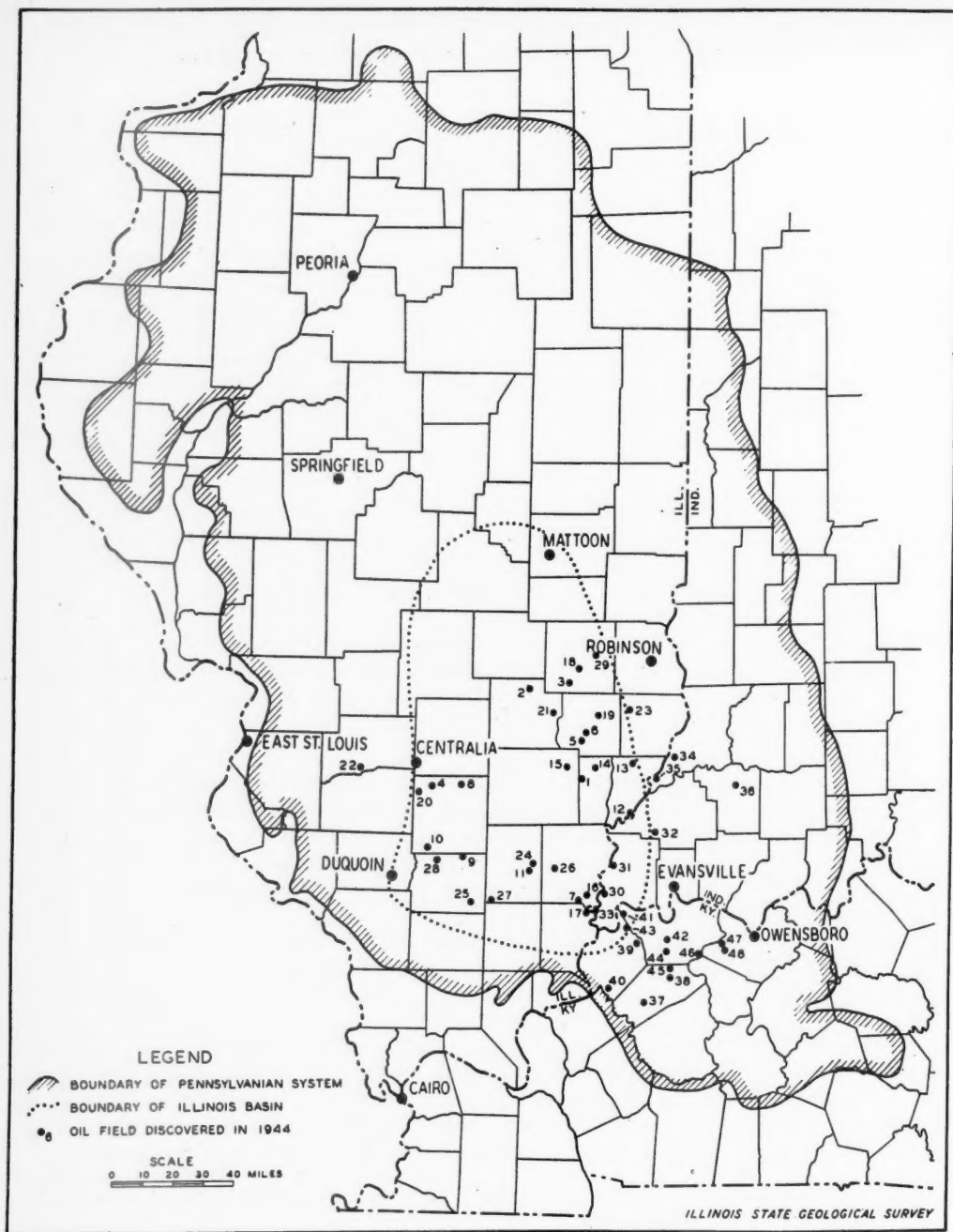


FIG. 1.—Map of Eastern Interior basin showing new oil pools discovered in 1944. For list of pools see Table I.

was from Pennsylvanian strata, 1 per cent from Ordovician strata and 0.5 per cent from Silurian strata.

Production in Kentucky west of the Cincinnati arch increased from approximately 6,160,000 barrels in 1943 to approximately 7,800,000 barrels in 1944, an increase of 26 per cent. In southwestern Indiana production decreased from 5,273,000 barrels in 1943 to 5,088,000 in 1944, a decrease of 4 per cent.

Most of the wildcat drilling in the Eastern Interior basin in 1944 was in the deep part of the basin, and most of the new pools discovered were in the deep basin area.

NEW POOLS DISCOVERED

As shown in Table I, 48 new oil pools were discovered in 1944 in the Eastern Interior basin. Of these 29³ are in Illinois, 7 are in Indiana, and 12 are in Kentucky.

The most noteworthy of the Illinois pools are: Boyd, Jefferson County, with 16 wells at the end of the year and a total production to the end of 1944 of 158,000 barrels; Roaches North, Jefferson County, with 25 wells and total production of 149,000 barrels; Divide West, Jefferson County, with 13 wells and total production of 67,000 barrels; and Calhoun, Richland County, with 6 wells and total production of 71,000 barrels.

ILLINOIS

All but one of the new pool discovery wells produced from Mississippian formations, of which 13 were in Chester series sandstones and 15 in the Ste. Genevieve formation of the Lower Mississippian. There was one small discovery well in the Pennsylvanian, the Lancaster East pool, Wabash County.

New producing formations.—Additional producing formations discovered in Illinois oil pools in 1944 numbered 37 of which 3 were in the Pennsylvanian, 18 were in the Chester series, and 16 were in the Ste. Genevieve formation of the Lower Mississippian series. There were no discoveries of new producing formations below the Ste. Genevieve formation.

Extensions.—Extensions to pools discovered by outpost wells (from $\frac{1}{4}$ mile to 2 miles from production), in Illinois numbered 41 of which 3 were in formations in the Pennsylvanian, 14 in the Chester series, 23 in the Lower Mississippian (all in the Ste. Genevieve formation) and 1 in the Silurian.

The Marine pool, which was discovered in 1943, was extended in 1944 by the addition of 24 producing wells, making a total of 28. It produces oil from a Silurian coral reef. Its 1944 production amounted to 480,000 barrels of oil. The Illinois Geological Survey is making a study of the subsurface geology of the Marine pool.

Exploratory methods and results.—Subsurface geology and the reflection seismograph continue to be the methods most used in the location of exploratory

³ This included Whittington West pool, Franklin County, which was discovered in December, 1943, but was not named until 1944.

TABLE I
POOLS DISCOVERED IN EASTERN INTERIOR BASIN IN 1944

Pool	County	Company and Farm	Location	Total Depth (Feet)	Depth to Top (Feet)	Producing Formation	Initial Production (Barrels) ^a	Date of Completion of Drilling	No. of Wells Producing in Field Jan. 2, 1945
ILLINOIS									
1. Birmingham South	Edwards	Nash Refining—G. C. Jones I	31°-N-10E	3253	3238	McClosky	132+67	7-18-44	1
2. Birmingham East	Edwards	W. R. H. Co.—H. J. Jones I	31°-N-10E	3158	3158	McClosky	132+67	7-18-44	1
3. Bogota South	Jasper	Schuller & Witt—Lourance I	31°-N-10E	3065	3054	McClosky	132+67	7-18-44	1
4. Boyd	Jefferson	Cameron—Bisot I	30°-S-2E	2063	2050	Bethel	178	7-22-44	15
5. Calhoun North	Richland	Phillips Pet.—Jennings I	30°-N-10E	3260	3166	Levias	178	8-23-44	1
6. Calhoun South	White	Pure Oil—Koertge I	33°-N-10E	3276	3165	Rosclaire; McClosky	149+97	1-2-45	2
7. Concord North	Jefferson	Great Lakes Carbon—Burriss I	7°-S-10E	3233	3233	Tar Springs	50	9-12-44	1
8. Concord South	Jefferson	Texas Co.—J. Green I	15°-S-10E	2832	2752	McClosky	50	2-29-44	1
9. Fitts	Jefferson	Texas Co.—J. Green I	15°-S-10E	2832	2752	McClosky	50	2-29-44	1
10. Fitzgerald	Jefferson	Texas Co.—Inland Steel I	4°-S-1E	3012	2770	Bethel	143+15	12-1-44	1
11. Goodville South	Hamilton	Nat'l Assoc. Pet.—Stocker I	33°-S-7E	3387	3384	McClosky	80+10	6-13-44	0
12. Kearsburg South	Wabash	Central Pipe Line—Garst I	27°-S-13W	2728	2713	Levias	173	6-13-44	0
13. Lancaster East	Edwards	Greuland—Case I	36°-2°-13W	2630	2630	Bethel	5	12-12-44	1
14. Maple Grove East	Edwards	Texas Co.—C. Lambright I	1°-N-10E	3242	3215	McClosky	133+42	6-6-44	3
15. Mt. Erie North	Wayne	Jabonski—Xorndorff—Ascher I	3°-N-9E	3226	3100	Aux Vases	47	8-25-44	4
16. New Haven North	Wayne	Jabonski—Xorndorff—Ascher I	10°-S-10E	3183	3178	Tar Springs	40	8-1-44	8
17. New Haven West	Gallatin	Oil Management—Goforth I	10°-S-10E	2183	2183	Tar Springs	130	8-1-44	8
18. Newton	Jasper	Texas Co.—Huddleston I	13°-6N-10E	3022	3020	McClosky	39+12	1-2-45	1
19. Olney East	Richland	Texas Co.—Wright I	24°-N-10E	3004	3080	McClosky	416	12-19-44	1
20. Roaches North	Jefferson	Texas Co.—Kashan I	8°-S-1E	2255	2103	Rosclaire	221+10	8-15-44	28
21. Sailor Springs E.	Clay	Magnolia Pet.—Mary A. Rinnert I	33°-N-10E	2512	2600	Cypress	32	8-29-44	9
22. Santa Fe	Clinton	Texas Co.—Althoff I	30°-1°-N-10W	2512	2512	Cypress	51+2	12-5-44	1
23. Shiner	Lawrence	Texas Co.—D. Smith I	10°-S-10E	3359	3281	McClosky	95	8-2-44	1
24. Thurgate	Hamilton	Nat'l Assoc. Pet.—Johnson I	15°-S-10E	3152	3113	Aux Vases	65	8-2-44	1
25. Thompsonville No.	Franklin	Deep Rock—Kirk Tr. I	15°-S-10E	3152	3113	Aux Vases	110+3	12-19-44	1
26. Trumbull	White	Lewis—Burkhard I	18°-5°-0E	2858	2830	Cypress	102	1-2-45	1
27. West End	Hamilton	Sinclair-Wyoming—Russell I	17°-7°-5E	3150	3131	Aux Vases	475	1-2-45	1
28. Whittington West ^b	Franklin	Murchison—Franklin Co. Coal I	11°-5°-S-E	2942	2752	Levias	8+5	12-14-43	3
29. Willow Hill	Jasper	Pure Oil—Dhom "A" I	34°-7N-10E	2715	2605	McClosky	213	11-28-44	1
INDIANA									
30. Upton	Posey	Bennett Bros.—Spencer I	32°-6S-14W	1266	1266	Tar Springs	86+86	1-20-44	1
31. S. New Harmony	Posey	Sells Pet.—Wade I	14°-S-14W	1266	1266	Hardinsburg	208+15	1-20-44	1
32. S. Owensville	Gibson	Cherry & Kidd—Virginia Baird	25°-S-12W	1266	1266	McClosky	163	8-3-44	1
33. West Hovey	Posey	Roger-Cartage Co.—Deakin & Lynch I	25°-S-12W	1266	1266	McClosky	55+40	10-7-44	1
34. Decker	Knox	Wm. P. Muller—B. M. McDowell I	30°-2°-N-11W	1266	1266	McClosky	22+30	4-13-44	1
35. Patton	Knox	Nat'l Drift Co.—Wm. P. Stecker I	35°-1°-N-11W	1266	1266	Bethel	48	6-22-44	1
36. Cato	Pike	H. C. Dietrick et al.—Knick I	8°-15°-N-11W	1266	1266	Cypress	18+5	9-14-44	1
KENTUCKY*									
37. East Clay	Webster	Carl Sneff et al Page I	9°-L-21	1003	1003	Penn. ss.	125	August	1
38. South Poole	Webster								
39. Waverly	Union	Farnes & Chenault—W. W. Slaton I	17°-M-9	1361	1347	Hardinsburg	40	December	1
40. Waverly	Union	Gardner & Co.—Kirk I	4°-O-20	2231	2216	Wabash	70	August	1
41. Rock Springs	Henderson	Nat'l Assoc. Pet. Co.—Rudy I	4°-O-23	2231	2216	Cypress	13	September	1
42. North Utley	Union	Trans. Tex Oil Co.—Culver I	12°-P-20	2710	2523	Levias	13	August	1
43. Wannemaker	Henderson								
44. East Poole	Webster	Sohio Oil Co.—Rash Hrs. I	24°-O-25	1727	1710	Tar Springs	89	July	1
45. McKinley	Henderson	Shell Oil Co., Inc.—Harrison I	14°-O-27	1633	1636	Cypress	37	September	1
46. Curdsville	Daviess	Miller & Sharella—Simmons I	26°-O-27	2033	1842	Aux Vases	25	April	1
48. St. Raphael	Daviess								

* Oil and water.

^b Discovered in 1943; named 2-3-44.

* Names of pools furnished by D. J. Jones, State geologist of Kentucky, personal communication, February 17, 1945; data on discovery wells from *Oil and Gas Journal* (January 27, 1945), p. 223.

DEVELOPMENTS IN EASTERN INTERIOR BASIN IN 1944 689

TABLE II
SELECTED LIST OF DRY TESTS IN ILLINOIS IN 1944

County	Company	Form	Location	Total Depth (Feet)	Depth to Top (Feet)	Deepest Formation	Date Completed
1 Bond	Magnolia	L. V. Hunter 1	15-6N-3W	2386	2276	Dutch Creek (Dev.)	11-14-44
2 Bond	Texas	Enloe 1	6-4N-2W	3397	3372	Trenton	5-2-44
3 Bond	Texas	F. M. Miller 1	22-6N-2W	2485	2416	Clear Creek (Dev.)	11-28-44
4 Bond	Union Prod. Pet.	Acconero 1	26-4N-4W	3170			11-28-44
5 Clark	Jansen	Carpenter 1	9-9N-12W	2735	2697	Devonian	6-6-44
6 Clark	Texas	Coldren 1	4-11N-11W	2406	2236	Devonian	10-3-44
7 Clark d	Wright	Hight 1	32-9N-14W	2570	2593	Devonian	10-17-44
8 Clinton	Stanoliad	Phillips 1	4-2N-3W	2513	2301	Devonian	2-1-44
9 Clinton	Strickland	Haake 1	32-2N-3W	2602	2498	Devonian	12-19-44
10 Clinton	Texas	Schumacher 1	29-3N-4W	2426	2225	Devonian	5-2-44
11 Douglas	Ohio	Shaw 1	36-16N-8E	4151	4045	Mt. Simon	1-2-45
12 Fayette	Texas	Sheridan-Stokes 1	7-8N-1E	3663	3607	Plattin	1-11-44
13 Ford	Herdson	W. J. Fecht 1	33-26N-9E	2237	2075	Oneota	2-1-44
14 Greene	Beatrice Creamery	Chicago Cold Storage 1	26-12N-13W	1100	1063	St. Peter	5-2-44
15 Greene	Johnson	Waller 1	12-11N-10W	1100	1001	Devonian	5-23-44
16 Hamilton *	Texas	Davis 14	7-6S-7E	5358	5020	Devonian	12-5-44
17 Hancock	Herdson	M. D. Laffey 1	17-3N-7W	3025	2760	Mt. Simon	3-14-44
18 Henderson	Northern Ordinance	Adams 1	28-8N-4W	323			6-27-44
19 Henderson	Northern Ordinance	Bohan 1	18-8N-4W	729	698	Maquoketa	7-18-44
20 Henderson	Northern Ordinance	Covert 1	35-8N-4W	725			8-1-44
21 Henderson	Northern Ordinance	Likely 1	1-9N-5W	410	405	Maquoketa	8-22-44
22 Henderson	Northern Ordinance	Pendarvis 1	17-9N-4W	446			6-27-44
23 Henderson	Northern Ordinance	Pendarvis 1	23-9N-4W	402			8-22-44
24 Henderson	Northern Ordinance	Tubbs 1	22-9N-4W	390			7-11-44
25 Henderson	Northern Ordinance	Tubbs 2	22-9N-4W	605			8-22-44
26 Henderson	Northern Ordinance	Schenck 1	15-8N-4W	674	667	Maquoketa	12-5-44
27 Jackson	Magnolia	Freemling-Reuscher 1	11-7S-4W	3582	3421	Trenton	6-27-44
28 Jefferson f	Nash Redwine	V. Laux 1	15-1S-2E	3765	3611	Devonian	6-20-44
29 Kendall	Herdson	R. Proctor 1	36-36N-8E	2328		Mt. Simon	2-2-44
30 McDonough	Northern Ordinance	Champion 1	9-6N-3W	642			11-7-44
31 McDonough	Northern Ordinance	Deems 1	26-7N-4W	760			11-14-44
32 Madison	Magnolia	Plocker 1	10-3N-5W	2897	2876	Plattin	12-19-44
33 Montgomery	Malone	Todd 1	21-11N-4W	632			4-4-44
34 Montgomery	Texas	Long 1	27-11N-5W	2525	2359	"Trenton"	6-13-44
35 Montgomery	Texas	Springfield Marine Bank 1	32-10N-3W	2714	2636	"Trenton"	5-2-44
36 Randolph	General Oil and Gas	Schmall 3	27-4S-7W	450			8-22-44
37 Randolph	General Oil and Gas	Schmall 4	27-4S-7W	427			11-28-44
38 Randolph	McHughes	Wilson 1	23-6S-6W	757	635	Aux Vases	4-18-44
39 St. Clair	Braun	Munier 1	27-1S-8W	309	185	Cypress	2-29-44
40 St. Clair	Sinclair-Wyoming	Bear 1	23-2N-6W	2575	2450	"Trenton"	10-24-44
41 St. Clair	Skelly	Schickedanz 1	12-3S-6W	2805	2684	"Trenton"	8-15-44
42 St. Clair	Young	McCurdy 3	32-3S-6W	530	506	Cypress	3-28-44
43 St. Clair	Young	McCurdy 4	29-3S-6W	618	590	Bethel	7-11-44
44 Saline	Brehm	Webb 1	28-8S-6E	3063	2855	Ste. Genevieve	12-19-44
45 Saline	Jarvis and Marcell	R. Raley 1	10-10S-6E	2974	1953	Cypress	1-25-44
46 Saline	Jarvis and Marcell	Sisk 1	15-10S-6E	1520	1498	Waltersburg	3-21-44
47 Saline	Magnolia	Pruett 1	7-9S-6E	2886	2615	Ste. Genevieve	7-11-44
48 Schuyler	Amberg and Miller	Taylor 1	30-1N-1W	630			6-20-44
49 Schuyler	Northern Ordinance	F. B. Greuel 1	7-3N-1W	684	617	Maquoketa	8-15-44
50 Schuyler	Northern Ordinance	E. Payne 1	3-3N-2W	756			10-10-44
51 Schuyler	Northern Ordinance	A. Yaap 1	1-3N-2W	783	664	Devonian	9-12-44
52 Shelby	Luttrell	McAndrew 1	15-10N-6E	2314	2298	St. Louis	10-31-44
53 Shelby	Lynch	Amling 1	20-12N-2E	1660	1558	Ste. Genevieve	6-27-44
54 Shelby	Texas	Nofke 1	31-11N-6E	2182	2070	Ste. Genevieve	3-28-44
55 Shelby	Thorpe	Hosteler 1	33-11N-4E	2034	1888	Ste. Genevieve	7-11-44
56 Union	Nation Oil	Gray 1	2-11S-1E	1949	1730	Ste. Genevieve	2-22-44
57 Washington	Hubbard	Sandheindrich 1	18-2S-5W	952	920	Aux Vases	2-1-44
58 Washington	Ruwalt	Brinkman 1	14-2S-5W	2475	2290	Devonian	2-8-44
59 Wayne g	Texas	Draper 1	8-3S-6E	5377	5169	Devonian	6-4-44
60 Wayne h	Texas	Greathouse 1	27-1N-6E	5200	5186	Clear Creek (Dev.)	11-14-44
61 Will	Livengood	E. L. Herren 1	23-36N-9E	1958	1904	Mt. Simon	11-14-44
62 Williamson	Browning	Hayton 1	32-9S-1E	2060	1958	Ste. Genevieve	12-12-44
63 Williamson	Superior	Pulley et al 1	13-9S-3E	2790	2776	St. Louis	4-18-44

d. Old well deepened. Near Johnson South field.

e. In Dale-Hoodville field.

f. In Dix field.

g. In Mayberry field. Old well deepened, plugged back to McClosky producer.

h. Old well deepened. In Johnsonville field.

wells. For the 29 pools discovered in 1944, 15 were reported to be discovered by subsurface geology, 7 by geophysics, 3 by a combination of geology and geophysics, 3 non-scientific, and 1 unknown.

The amount of seismograph work in Illinois in 1944 was approximately half that done in 1943. The reason for the decline in the use of the seismograph appears to be that the large structures have already been located and the structures remaining to be discovered are smaller. Numerous structures which produce oil in Illinois are so small as to be near the limits of error of the reflection-seismograph method now in use.

Wildcat drilling.—Wildcat drilling continued at a high rate during 1944, increasing somewhat in the latter part of the year. The number of wildcat wells completed in 1944 was 441 as compared with 462 in 1943, but the number of these located 2 miles or more from production was 266 in 1944 and 243 in 1943, an increase of 23. Counting only the wildcats 2 or more miles from production, the proportion of successful wildcats was 12 per cent in 1943 and 11 per cent in 1944. It is reasonable to expect that one wildcat in 10 will be successful in 1945.

A number of wildcat tests were drilled in the non-producing parts of the Eastern Interior basin in northern and western Illinois north of the Colmar-Plymouth pool (Table II). Some of this drilling was financed by profits from war industries.

Deep testing.—There was less deep testing in Illinois in 1944 than had been anticipated because available drilling equipment was used mainly for pool development drilling of the shallower formations after the well-spacing restrictions were relaxed in April, 1944. No pre-Mississippian pools were discovered.

Five deep tests are of special interest (Table II, Nos. 11, 16, 28, 59, and 60).

The Ohio Oil Company's Shaw well No. 1 (11) near Tuscola is located on top of a large closed dome on the LaSalle anticlinal belt and in an area where the uppermost bedrock is Devonian limestone. It had a total depth of 4,151 feet and reached the top of the Mt. Simon formation in the Cambrian at the depth of 4,045 feet. Oil stains were found in the "Trenton" limestone but no oil showings were found below that.

The other four deep tests are Devonian tests in the Illinois basin, one each in the Johnsonville (60), Mayberry (59), and Dale-Hoodville (16) pools, and one on the edge of the Dix pool (28). The last named had a showing of oil in the Devonian, but none of the four Devonian tests had any large porous zones comparable with the producing zone in the Salem and Centralia pools.

The Devonian strata in The Texas Company's Draper well No. 1 (Table II, No. 59) in the Mayberry pool, Wayne County, consist of the following.

	Thickness (Feet)	Depth (Feet)
Top, Devonian limestone		5169
Lingle? formation—limestone, cherty, light brownish gray	63	5232
Grand Tower? formation—limestone, white, coarsely crystalline	98	5330
Dutch Creek formation—sandy limestone grading to sandstone	10	5340
Clear Creek formation—limestone, cherty, dolomitic, light brownish gray	37	5377

The lower part of Grand Tower (?) is slightly vesicular and showed slight oil stain. No vesicular dolomite of the type that produces in the Salem pool, probably to be correlated with the Geneva of Indiana, was found in either this well or Nash Redwine's Laux No. 1 in Sec. 15, T. 1 S., R. 2 E., Jefferson County.

INDIANA

The number of wells in Southwestern Indiana in 1944 was 276, about 40 per cent less than the number drilled in 1943, according to data furnished by Ralph E. Esarey, State geologist, Department of Conservation, Indianapolis, Indiana. Of the 276 wells completed, 136 were oil producers, 8 were gas producers and 132 were dry holes.

Drilling was largely concentrated in a few counties in the extreme southwest part of Indiana. Two counties, Gibson and Posey, had 88 well completions each, or a total of 176, which amounted to 64 per cent of the total for southwestern Indiana.

Total production of oil in Indiana in 1944 was 5,118,000 barrels (U. S. Bureau of Mines Monthly Petroleum Statement No. P 258) nearly all of this being from the southwestern part of the state.

In 1944, 62 wildcat wells were completed in southwestern Indiana. Most of these were completed in the Chester series or in the Ste. Genevieve formation (McClosky limestone) of the Lower Mississippian, but a few penetrated the St. Louis limestone, next below the Ste. Genevieve. In Perry County, the Henry Delaisse well No. 1 in the Bristow pool tested the Trenton limestone, top 3,151 feet, total depth 3,255 feet. No tests to the Devonian or deeper were drilled in the Gibson and Posey County area.

WESTERN KENTUCKY

The following statement regarding developments in Kentucky in 1944 was furnished by D. J. Jones, State geologist, Lexington, Kentucky.

As the need for bolstering oil reserves became urgent during the war, a continually increasing number of wildcat wells have been drilled in Kentucky, particularly west of the Cincinnati arch. The results were gratifying, and the new pools discovered in the last 3 years have doubled production. In 1944 Kentucky produced slightly more than 9,500,000 barrels of oil, an all-time record. A large percentage of this increase came from western Kentucky.

Development in the western Kentucky coal basin, the southern extension of the Illinois basin, has resulted in the discovery of twelve new fields. Incomplete records of drilling show that approximately 700 tests were drilled during the year in that part of the state, involving twenty-five counties west of the Cincinnati arch, of which slightly more than half were producers. This means that the rate of drilling has been increased three-fold over that of 1942.

Producing formations ranged from the Pennsylvanian to the McClosky of the Lower Mississippian. Fifteen unsuccessful Devonian tests were drilled. There were no Knox dolomite tests.

A summary of drilling operations reveals that out of a total initial production of 48,000 barrels, 37,500 barrels were produced from the Waltersburg, Tar Springs and the Cypress of the Chester and 8,500 from the McClosky. The Pennsylvanian and the Hardinsburg, Jackson, Bethel, and Cunningham of the Chester accounted for the remainder.

Daily production for the month of December, 1944, averaged approximately 29,000 barrels as against less than 21,000 barrels for December, 1943. In anticipation of the discovery of the usual number of new pools in western Kentucky, it is expected that the 1945 production will exceed that of 1944.

OUTLOOK FOR 1945

The rate of drilling in the Eastern Interior basin is expected to continue about the same in 1945 as in 1944 with probably an increase in the number of wildcat tests. The high demand for oil for both military and civilian uses will continue to stimulate oil production by all possible means, including exploratory and pool-development drilling and secondary-recovery methods.

Increased costs of drilling and shortage of equipment and manpower are factors which limit the rate of drilling development. Since May 21, 1941, the price of crude oil has been frozen but since that time drilling and production costs have risen sharply. The price premium for stripper well production is of some help but it does not meet the situation.

Geological data from thousands of wells in the Eastern Interior basin reveal a different picture of the oil reservoirs from that available 2 or 3 years ago. Production is from many small lenticular reservoirs and many producing structures are so small as to be near the limits of error of the reflection seismograph. This means that aside from the possibility of pre-Mississippian production in the basin, wildcat drilling from Mississippian and Pennsylvanian sands will continue in the Eastern Interior basin for many years and that many more pools, extensions, and new producing formations remain to be discovered and developed. This and the expansion of secondary recovery of oil promise well for the future of the oil industry in this region.

DEVELOPMENTS IN MICHIGAN IN 1944¹

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ABSTRACT

Well completions in Michigan during 1944 increased 18 per cent and the number of permits issued increased 12 per cent over 1943. Total footage drilled was 1,655,240 feet, approximately 33,000 feet more than for the previous year. Of the total number of wells drilled, 44 per cent were productive—the same proportion as in 1943. Two-thirds of the state's completions and more than four-fifths of the successful wells were in the "Basin" area.

Two hundred sixty-nine wildcat tests were drilled in 1944. Nine oil fields and three gas fields were discovered and three oil fields extended. New pay zones were found in three fields. The Coldwater, Isabella County, Deep River, Arenac County, and Essexville, Bay County, fields added appreciably to the state's oil reserves. All are in the "Basin" and production is from the Dundee (Devonian) formation. None of the southwestern Michigan Traverse (Devonian) discoveries added large reserves, but Hilliards and South Monterey, Allegan County, were the most active. Average initial production of all wells was 461 barrels per day in 1944, contrasted with an average initial of 307 barrels in 1943. Oil production continued the decline started in 1943. Eighteen million, four hundred eighty-nine thousand, four hundred seventy barrels, a decrease of 11 per cent, were produced.

Gas well completions increased to sixty-four, seventeen more than in 1943. The majority of the gas wells were drilled in old fields in Clare, Mecosta, Newago, and Osceola counties. None of the three 1944 discoveries was developed to more than a one-well pool at the end of the year. Gas production increased 8 per cent over 1943 to reach an all-time high of 21,253,903,000 cubic feet.

Seismograph parties were active during the year in the "Thumb" district. Although one discovery, the Pinconning field, Bay County, was credited to seismograph exploration, subsurface geology supplemented by core-test information continued to be the most effective and popular method of exploration. Permits for 181 geological tests were issued during the year, compared with 376 issued in 1943. Twenty-five per cent of the tests were in the "Thumb" district and the remainder in the "Basin" and northeastern counties.

One of the highlights of wildcat activity was the drilling of four tests which penetrated the pre-Cambrian granite and one which was drilled into the Cambrian sandstone. All were located in the southeastern part of the state.

INTRODUCTION

Oil and gas development in Michigan showed a general increase in 1944. During the year, 710 wells were completed, of which 310 were productive, whereas in 1943, 635 were completed and 280 were productive. Total footage drilled was 1,655,240 feet, compared with 1,622,313 feet in 1943. Two hundred sixty-nine wildcat tests were drilled in 1944. The program resulted in the extension of three oil fields and the discovery of twelve oil and gas fields and of new pay zones in three fields.

OIL

The "Basin" (central Michigan) was the most active area in the state, having two-thirds of the completions and four-fifths of the oil and gas wells. Comparative distribution of wells between this district and southwestern Michigan is shown in Table I.

Oil production was 18,489,470 barrels in 1944, or 2,278,254 barrels less than produced in 1943. Of the nine oil fields discovered during the year (Table II), only three apparently add much oil to the state's reserve.

¹ Manuscript received, April 2, 1945.

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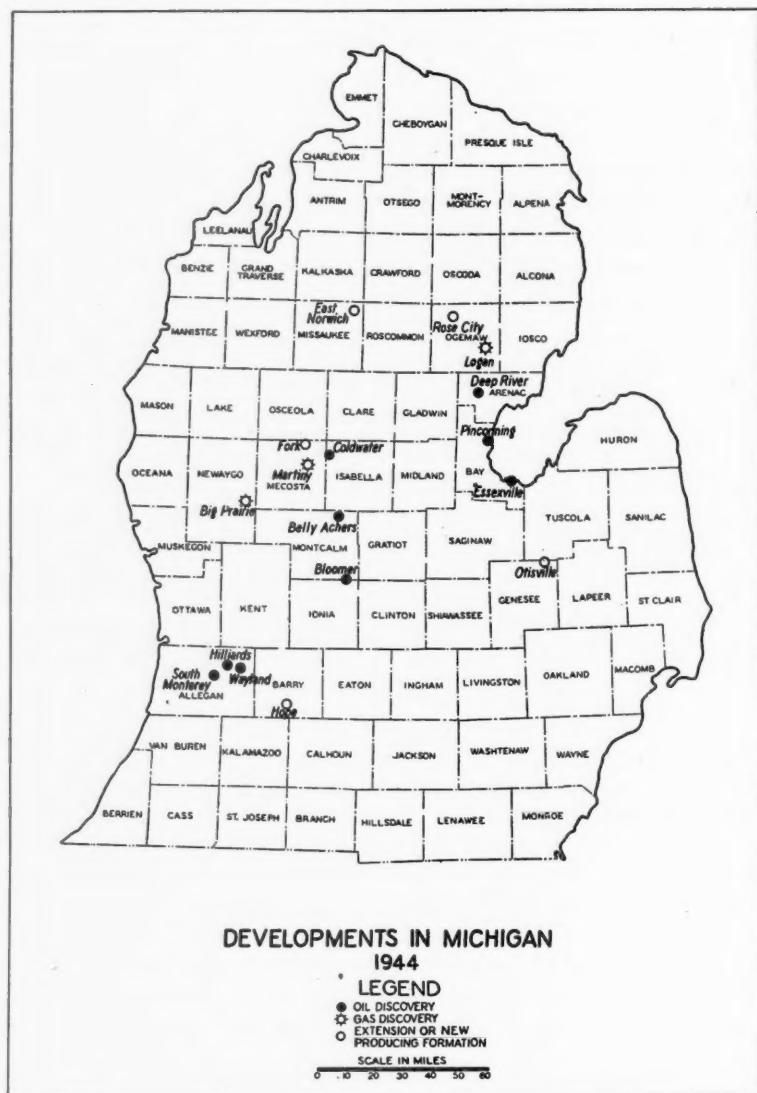


FIG. 1

DISCOVERIES

The Deep River oil field, Arenac County, was discovered on January 27, 1944, by the Basin Oil Company and Don Rayburn's Werblo No. 1, Sec. 8, T.

19 N., R. 4 E. The well was completed in the Dundee formation at the depth of 2,846 feet. It had an initial flow of 329 barrels in 4 hours after acidizing. The pay zone in the field is a dolomite that ranges from the top of the Dundee to as much as 20 feet in the formation. Wells have penetrated from one to 11 feet of productive dolomite, and apparently no well has penetrated the entire pay zone. Initial productions, the majority of which are natural flows, have ranged from 55 to 300 barrels per hour. At the end of the year, 17 wells had been completed in the field, and a productive area possibly about 2 miles long and $\frac{1}{2}$ mile wide with a north-

TABLE I
SUMMARY OF OPERATIONS, BY DISTRICTS, IN MICHIGAN DURING 1944

District	Permits Issued	Wells Completed	Oil Wells	Initial Production Oil (Barrels)	Gas Wells	Initial Production Gas (1000 Cu. Ft.)	Dry Holes	Total Production 1944	
								Oil (Barrels)	Gas (1000 Cu. Ft.)
Southwestern	238	229	98	8,031			131	1,685,485	97,886
Michigan Basin	465	445	148	105,323	63	299,951	234	16,769,352	21,156,017
All other parts of state	38	36			1	658	35	34,633	
Totals	741	710	246	113,354	64	300,609	400	18,489,470	21,253,903

west-southeast trend was indicated. The Deep River field bears a striking similarity to the "dolomite pay" part of the Adams field, Arenac County. In the Adams field, 26 wells, in an area 2 miles long and ranging from $\frac{1}{4}$ to $\frac{1}{2}$ mile in width, have produced from an apparently similar "pay" an average of 15,470 barrels per acre and a total of 4,022,219 barrels since its discovery in July, 1940.

The Sohio Petroleum Company's Cummings No. 1, Sec. 33, T. 16 N., R. 6 W., opened the Coldwater oil field, Isabella County, on August 6, 1944. The well had an initial natural flow of 224 barrels per day through a $\frac{1}{4}$ -inch choke. Production is from the Dundee formation at the depth of 3,698 feet. The pay zone in the field is about 3 feet below the top of the Dundee and an average of 9 feet of "pay" has been drilled. Initial production, all natural flows except one, ranged from 83 to 860 barrels per day. Thirteen wells were completed during the year and a possible producing area of 2000 acres is indicated.

The Essexville oil field, Bay County, was discovered January 14, 1944, by the United Drillers and Producers, Inc., Arms No. 1, Sec. 7, T. 14 N., R. 6 E., in the Dundee limestone at the depth of 2,881 feet, with an initial daily production, after acidizing, of 118 barrels. In December, 1944, the field was extended almost 2 miles eastward by the company's Walraven and Badour No. 1, Sec. 16, T. 16 N., R. 6 E. The pay zone in the Essexville field is about 200 feet below the Dundee top and averages 20 feet in thickness. Permeability varies greatly in the pay zone and initial productions range from 10 to 300 barrels per day. At the close of 1944, 10 wells had been completed in the field.

FIELD DEVELOPMENT

The Fork field, Mecosta County, discovered in 1942, was enlarged to 2,110 acres by drilling 17 wells during 1943. Part of this increase is accounted for by the

TABLE II
FIELDS, EXTENSIONS AND NEW PRODUCING FORMATIONS DISCOVERED IN 1944

County	Field	Section Township Range	Operator	Well	Permit Number	Month and Day 1944	Total Depth (feet)	Initial Production		Formation	Number Wells Jan. 1, 1945
								Oil (Barrels)	Gas (1000 Cu. Ft.)		
New Fields											
Hillsdale	Hilliards	4-3N-12W	Charles W. Cook	Beaver 1	10669	4-11	1,578	300		Traverse	15
Allegan	S. Monterey	27-3N-13W	Alan W. Winchester	Fleece 1	11060	7-15	1,024	28		Traverse	7
Allegan	Wayland	8-3N-11W	R. Donnersberger & T. Aliman	Krubee 1	11080	10-27	1,801	35		Traverse	1
Allegan	Deep River	8-10N-4E	Basin Oil Co. & Don Rayburn	Wetbilo 1	10433	1-27	2,846	320 per 4 hrs.		Dundee	17
Arenac	Essexville	7-14N-5E	United Drillers & Producers, Inc.	Arms 1	10458	1-14	2,881	118		Dundee	10
Bay	Pinconning	2-16N-4E	Shell Oil Co., Inc.	Koth 1	10944	9-15	3,012 pb	115 per hr.		Dundee	1
Bay	Goldwater	33-16N-6W	Sohio Petroleum Co.	Cummings 1	10873	8-6	3,668	224		Dundee	13
Isabella	Ypsilanti	12-15N-6W	Richards Consolidated Gas Co.	Evans 1	11150	11-11	1,397 pb	72	420	"Mich. Stray"	1
Macosta	Belly Achers	14-12N-6W	Stewart Oil Co. & Burks White	Jorgensen 1	10445	1-31	3,478	72		Dundee	5
Montcalm	Bloomer	32-0N-5W	H. L. Wadsworth	Peters 1	10450	7-9	2,660	225		Traverse	5
Montcalm	Big Prairie	16-13N-11W	Consumers Power Co.	Company 1	10945	8-7	1,045		4,580	"Mich. Stray"	1
Ogemaw	Logan	17-22N-4E	Sun Oil Co.	Holsboe 1	10836	9-28	4,537 pb	1,663	700	Berea	1
Field Extensions											
Barry	Hoye	2-3N-9W	Harold E. Smith	Lechman 1	10519	2-1	1,807	110		Traverse	
Bay	Essexville	16-14N-6E	Walraven & Ba-								
Bay			door 1		10859	12-4	2,800	160		Dundee	
Macosta	Fork	1-16N-3W	Sun Oil Co.	Church 1	10827	8-16	3,017	769 per 10 hrs.		Dundee	
Macosta	Fork	16-10N-7W	Smith Petroleum Co.	Buss 1	10875	8-14	3,782	99		Dundee	
Missaukee	E. Norwich	16-24N-5W	Sun Oil Co.	Hornet 14	10937	12-16	4,561 pb	4,458	60	Detroit River	
New Producing Formations											
Genesee	Otisville	6-0N-8E	Clyde L. Palmer	Davidson 1	10916	8-31	2,502	15		Dundee	
Genesee	E. Norwich	16-24N-5W	Sun Oil Co.	Hornet 12	10758	7-11	3,143 pb	2,642	50	Traverse	
Missaukee	Rose City	29-24N-2E	Muskegon Development Co.	State-Foster A-3	10891	10-19	2,039	60		Traverse	

DEVELOPMENTS IN MICHIGAN IN 1944

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TABLE III
MICHIGAN OIL FIELDS*
(January 1, 1945)

Field	County	Year of Discovery	Producing Formation	Depth to Pay (Feet)	API Gravity of Oil	Drilled Acreage	Recovery per Drilled Acre (Barrels)	Production in 1944 (Barrels)	Accumulative Production (Barrels)	No. of Prod. Wells Jan. 1, 1945
Adams	Arenac	1937	Traverse	2,025	37.0	720	6,586	1,176,690	4,742,024	66
Akron	Tuscola	1938	Dundee	2,930	34.0	**	**	24,657	186,742	7
Bangor	Van Buren	1939	Traverse	1,000	29.5	260	1,094	58,238	518,233	17
Beaverton	Gladwin	1934	Dundee	3,880	41.3	230	3,000	20,720	600,050	12
Belly Achers	Montcalm	1944	Dundee	3,470	48.2	200	252	50,464	50,464	5
Bentley	Gladwin	1937	Dundee	3,510	42.1	640	1,429	94,130	914,384	43
Birch Run	Saginaw	1934	Berea	1,530	43.3	260	817	6,094	212,513	26
Bloomer	Montcalm and Ionia	1944	Traverse	2,640	42.3	200	240	48,009	48,009	5
Bloomingsdale	Van Buren	1938	Traverse	1,220	42.0	1,380	4,339	122,378	5,987,855	82
Breedsville	Van Buren	1943	Traverse	1,080	33.9	180	669	60,882	120,403	15
Cedar	Osceola	1943	Traverse	3,325	48.1	360	893	162,414	321,688	9
Chase	Lake	1942	"Berea"	3,810	48.1	360	893	162,414	321,688	9
Clare City	Clare	1938	"Mich. Stray"	2,466				882	1,168	1
Clayton	Arenac	1936	Dundee	1,320	30.2	610	6,584	4,057	29,451	3
Coldwater	Isabella	1944	Dundee	2,550	34.2	520	131	181,110	4,010,233	44
Columbia	Van Buren	1938	Traverse	3,755	46.0	520	131	68,420	68,420	13
Cranberry Lake	Clare	1943	Dundee	1,185	39.0	1,100	1,887	40,860	2,075,092	30
Crystal	Montcalm	1935	Dundee	3,800				4,620	9,612	1
Currie	Isabella	1936	Dundee	3,100	43.5	1,820	4,011	43,233	7,290,701	21
Dallas	Clinton	1942	Traverse	3,020	45.9			3,468	161,755	2
Dalton	Muskegon	1940	Traverse	2,470				1,242	2,817	3
Deep River	Arenac	1944	Dundee	1,845		340	2,164	13,813	16,682	9
Deerfield	Monroe	1920	Trenton	2,800		155	2,520	735,031	735,031	17
Diamond Springs	Allegan	1938	Traverse	2,115	42.7			34,318	390,278	17
Dorr	Allegan	1938	Traverse	1,465	41.0	420	1,931	24,949	811,233	25
			Traverse	1,605	41.0	260	1,176	10,747	305,820	16
			Salina ?	3,035	22.0					
East Norwich	Missaukee	1942	Traverse	2,410						
			Dundee	3,082		760	270	183,757	211,976	19
			Detroit River	4,380						
Edenville	Midland	1938	Dundee	3,790	41.0	350	3,435	28,656	1,202,422	23
Edmore	Montcalm	1933	Traverse	3,105	43.2	90	5,004	9,167	450,388	5
Enterprise	Missaukee	1942	Dundee	4,420				8,928	11,118	2
Essexville	Bay	1944	Dundee	2,860		400	316	126,607	126,607	10
Evart	Osceola	1942	Dundee	3,755	47.8	1,100	1,777	724,431	1,954,933	28
Fillmore (includes Holland)	Allegan	1943	Traverse	1,525	41.1	420	617	232,825	259,155	40
Fork	Mecosta	1942	Dundee	3,850	50.1	2,110	1,087	1,436,010	2,293,727	51
Geneva	Van Buren	1940	Traverse	1,010	31.5			3,889	19,080	6
Goodwell	Newaygo	1943	Traverse	2,760				691,757	691,757	30
Grout	Gladwin	1940	Dundee	3,825		1,200	576	407,871	25,726	3
Hamilton	Clare	1940	Dundee	4,078				3,713	25,726	3
Hatton	Clare	1941	Dundee	4,078				2,874	15,997	1
Headquarters	Roscommon and Clare	1941	Traverse	3,945				53,431	101,861	3
Hilliards	Allegan	1944	Detroit River	3,380	42.3	1,440	4,066	1,211,892	5,846,070	38
Hope	Barry	1939	Traverse	4,955	48.9	320	169	54,038	54,038	15
Hopkins	Allegan	1939	Traverse	1,590	39.0			7,792	15,314	6
			Berea	1,635	41.5	75	1,670	5,638	125,250	4
			Salina	1,505	38.0					
Kawkawlin	Bay	1938	Dundee	2,830	35.0	2,080	1,025	724,078	2,132,003	124
			Dundee	7,368	55.3					
Lakefield	Saginaw	1937	Dundee	3,185	39.0			1,012	7,579	1
Leaton	Isabella	1930	Dundee	3,655	43.0	880	3,633	97,805	3,107,142	41
Marne	Ottawa	1940	"Berea"	1,165				1,145	5,606	2
Mill Lake	Van Buren	1938	Traverse	1,290	40.0	340	1,373	10,350	466,703	10
Monterey	Allegan	1938	Traverse	1,645	37.6	280	1,473	15,963	412,518	18
Mount Haley	Midland	1934	Dundee	3,477	39.6			1,128	33,458	1
Mt. Pleasant	Isabella and Midland	1928	Dundee	3,545	41.8	4,180	5,376	283,233	22,471,881	169
Muskegon	Muskegon	1927	Traverse	1,700	37.4	2,800	2,414	21,238	6,760,302	30
Muskat Lake	Van Buren	1941	Traverse	2,025	32.0	580	495	28,782	287,453	27
New Salem	Allegan	1938	Traverse	1,285	39.2	970	3,810	174,157	3,696,262	72
North Bangor	Van Buren	1942	Traverse	1,625	41.0			90,590	248,655	10
North Buckley	Gladwin	1937	Dundee	1,015	32.6	250	995	321,008	15,373,824	155
Otisville	Genesee	1941	Traverse	3,615	30.0	2,710	5,673	321,008	15,373,824	155
Overisel	Allegan	1938	Traverse	1,894	44.3			1,161	5,119	2
Pinconning	Bay	1944	Dundee	2,449	37.0			86,013	2,261,425	83
			Dundee	1,490	42.1	1,550	1,450	9,824	9,824	1
			Dundee	2,898	36.2					

TABLE III—Continued

Field	County	Year of Discovery	Producing Formation	Depth to Pay (Feet)	API Gravity of Oil	Drilled Acre-age	Recovery per Drilled Acre (Barrels)	Production in 1944 (Barrels)	Accumulative Production (Barrels)	No. of Prod. Wells Jan. 1, 1945
Pine River	Montcalm	1938	Traverse	2,836				4,893	43,464	1
Pine River	Gratiot	1942	Dundee	3,280	45.0			1,835	9,063	2
Polkton	Ottawa	1942	Traverse	1,880				1,748	1,094	1
Porter	Midland	1933	Dundee	3,415	40.6	4,330	7,837	625,693	33,032,708	233
Prosper	Missaukee	1942	Dundee	3,835	43.2	520	1,240	245,264	644,079	12
			Traverse	2,925						
Reed City	Osceola and Lake	1940	Dundee	3,490	46.3	5,270	4,725	5,194,216	24,899,701	184
			Detroit River	3,585						
Richfield	Roscommon	1941	Detroit River	4,185	43.4	600	358	65,729	214,976	15
Riverside	Missaukee	1942	Dundee	3,944	44.5			8,809	31,852	1
			Traverse	2,040						
Rose City	Ogemaw	1942	Detroit River	4,100	41.2	200	156	26,658	31,152	5
Rose Lake	Osceola	1943	Traverse	3,115	45.4	680	775	437,082	526,759	17
Saginaw	Saginaw	1925	Berea	1,825	46.1	1,500	954	17,108	1,431,724	44
Salem	Allegan	1937	Traverse	1,570	38.3	2,110	1,481	77,626	3,125,050	124
Sauble	Lake	1942	Traverse	2,145	35.0	200	307	12,343	61,435	4
Sherman	Isabella	1936	Dundee	3,650	42.0	870	4,903	91,100	4,265,610	49
South Akron	Tuscola	1941	Dundee	2,850	37.3			2,701	12,247	2
South Beaverton	Gladwin	1936	Dundee	3,845	41.1	340	1,573	77,593	534,921	22
South Buckeye	Gladwin	1936	Dundee	3,570	39.0	2,040	1,945	86,649	3,967,843	75
South Monterey	Allegan	1944	Traverse	1,655	40.0	70	276	19,333	19,333	7
South Tallmadge	Ottawa	1939	Traverse	1,820	38.6	570	720	49,977	410,493	52
Temple	Clare	1938	Dundee	3,885	44.3	2,500	5,574	392,398	13,935,951	101
Trowbridge	Allegan	1937	Traverse	1,355	41.2	530	364	23,370	193,036	28
Vernon	Isabella	1930	Dundee	3,755	44.1	790	5,727	64,925	4,524,107	25
Walker	Kent & Ottawa	1938	Traverse	1,850	40.0	4,835	2,030	350,936	9,815,775	398
West Beaverton	Gladwin	1943	Dundee	3,876				2,038	7,248	1
West Branch	Ogemaw	1933	Dundee	2,650	36.8	2,670	2,044	270,860	5,457,191	222
West Hopkins	Allegan	1941	Traverse	1,580		310	1,203	18,281	373,076	21
Winfield	Montcalm	1936	Dundee	3,340	43.2			2,692	54,052	4
			Traverse	3,105						
Winterfield	Clare	1940	Dundee	3,770	44.2	960	3,572	377,095	3,420,036	38
			Detroit River	5,015						
Wise	Isabella	1938	Dundee	3,700		1,300	1,627	209,316	2,114,874	64
Woodville	Newaygo	1943	Traverse	2,820	45.2	280	439	53,982	122,888	7
Wyoming Park	Kent	1939	Traverse	1,880	39.0			9,096	121,048	12
Yost	Midland	1932	Dundee	3,420	40.6	2,010	3,663	233,956	7,361,800	85
Zeeland	Ottawa	1942	Traverse	1,495	41.9	640	277	57,901	185,790	12
Miscellaneous								1,908	253,183	19
Total state								18,489,470	222,604,251	3,433

* Fields which are abandoned or have produced less than 500 barrels during 1944 are not included.

** Drilled acreage and recovery per acre not calculated for fields in which wells are too few or scattered to be significant.

Sun Oil Company's Church No. 1, Sec. 1, T. 16 N., R. 8 W., which extended the field a mile westward. Thirteen wells were drilled in the East Norwich field, Missaukee County, a 1942 discovery; its drilled area was increased to 760 acres by new wells which included a well that extended the field $1\frac{1}{2}$ miles southwest, and also a Traverse limestone producer. The Dundee and Detroit River formations had previously been proved productive. The Kawkawlin field, Bay County, discovered in 1938, was increased to 2,080 acres by the drilling of 13 wells. The area of the Adams field, Arenac County, discovered in 1937, was increased by 11 wells, and to the Goodwell field, Newaygo County, discovered in 1943, 10 wells were added.

In southwestern Michigan, the Fillmore field, Allegan County, was increased to 420 acres by 34 new wells. Nine wells, mainly inside locations, were drilled in the Breedsville field, Van Buren County. Both fields were 1943 discoveries.

NATURAL GAS

Sixty-four gas wells were completed in 1944, compared with 47 in 1943. Most of the wells were drilled in previously discovered fields in Clare, Mecosta, Newaygo, and Osceola counties. A new all-time high of 21,253,903,000 cubic feet of gas was produced during the year, an increase of 1,672,483,000 cubic feet over 1943.

DISCOVERIES

Three gas fields were discovered in 1944 (Table II), but all were one well pools at the end of the year. Only one of the discoveries, Big Prairie, Newaygo County, appears to be of importance.

FIELD DEVELOPMENT

The Cranberry Lake gas field, Clare County, a 1943 discovery, was increased to 5,600 acres by the drilling of 14 wells. Thirteen wells were drilled in the Good-

TABLE IV
MICHIGAN GAS FIELDS
(January 1, 1945)

Field	County	Year of Discovery	Producing Formation	Depth to Pay (Feet)	Drilled Acreage	Recovery per Drilled Acre (M.Cu.Ft.)	Production in 1944 (M.Cu.Ft.)	Accumulative Production (M.Cu.Ft.)	No. of Prod. Wells Jan. 1, 1945
*Broomfield	Isabella	1929	"Mich. Stray"	1,350	4,760	2,044	811,978	9,720,805	59
Clare City	Clare	1938	"Mich. Stray"	1,290	720	1,928	116,964	1,388,104	7
Clayton	Arenac	1936	Berea	1,180	1,440	3,030	455,652	4,363,016	23
Cranberry Lake	Clare	1943	"Mich. Stray"	1,295	5,600	149	832,864	835,477	35
**Crystal	Montcalm	1935	"Mich. Stray"	1,000	320	1,934	65,701	618,898	5
Deep River	Arenac	1936	Berea	1,490	1,040	863	341,052	897,575	9
*Deerfield	Isabella	1941	"Mich. Stray"						
Edmore	Montcalm	1936	"Mich. Stray"	1,300	4,400	1,269	870,566	5,584,726	16
Evart	Osceola	1941	"Mich. Stray"	1,415	2,560	434	812,140	1,112,108	16
Fork	Mecosta	1942	"Mich. Stray"	1,495	1,600	65	81,633	103,035	10
Freeman	Clare	1939	"Mich. Stray"	1,475	2,040	1,232	600,424	2,513,941	15
Fremont	Isabella	1941	"Mich. Stray"	1,235	640	353	75,750	226,250	3
Goodwell	Newaygo	1943	"Mich. Stray"	1,135	2,080	41	85,767	85,767	13
Lincoln	Clare	1938	"Mich. Stray"	1,530	2,400	1,959	1,075,786	4,702,090	13
Marion	Clare & Osceola	1940	"Mich. Stray"	1,370	10,080	932	3,141,925	9,395,963	62
Muskegon	Muskegon	1927	Traverse & Detroit River	1,640	1,200	5,042	80,449	7,130,010	8
North Star	Gratiot	1940	"Mich. Stray"	870	160	789	33,063	126,363	1
Reed City	Osceola & Lake	1940	"Mich. Stray"	1,220	4,480		4,010,878	9,306,010	23
Richland	Montcalm	1940	"Mich. Stray"	1,205	800	526	124,830	420,556	5
Riverside	Missaukee	1940	"Mich. Stray"	1,435	2,720	638	704,497	1,733,496	10
Salem	Allegan	1941	Salina	2,725	160	539	17,437	86,314	1
Shaver	Gratiot	1935	"Mich. Stray"	1,020	2,600	2,769	1,227,695	7,200,902	44
Sheridan	Mecosta	1935	"Mich. Stray"	975	320	775	16,285	248,099	4
Six Lakes	Montcalm & Mecosta	1934	"Mich. Stray"	1,270	9,520	4,192	4,385,285	39,910,916	147
Sylvan	Osceola	1941	"Mich. Stray"	1,525	320	210	20,925	70,364	1
Vernon	Isabella	1930	"Mich. Stray"	1,300	760	1,887	4,981	1,434,040	1
Walker	Kent	1939	"Berea"***	1,150					
Winfield	Montcalm	1940	Detroit River	2,250			38,241	4,063,603	4
Wise	Montcalm	1935	"Mich. Stray"	1,125	3,040	1,023	510,596	3,111,454	18
Woodville	Isabella	1940	"Mich. Stray"	1,250	800	1,240	275,339	999,309	6
Miscellaneous	Newaygo	1943	"Mich. Stray"	1,185	2,080	86	178,511	178,511	12
							157,089	22,388,501	80
Total state							21,253,903	139,966,472	657

* Deerfield appears to be an extension of Broomfield. Data from Deerfield included in Broomfield.

** Includes gas wells in Ferris and Crystal townships.

*** A sandy dolomite in the western part of the state at the horizon of the Berea sandstone.

well field, Newaygo County, which was discovered but not developed in 1943. Both the Evart field, Osceola County, and the Woodville field, Newaygo County, added 8 new wells.

EXPLORATION

Shallow-hole core-testing activity showed a 50 per cent decrease in 1944, for only 181 permits for geological tests were issued compared with the 376 issued in 1943. One-fourth of these tests were drilled in the "Thumb" district. However, despite the lessened activity, core-testing continued to be the most popular and effective method of exploration. Seismograph surveys were continued in the "Thumb" and a gravimeter party was also reported to be exploring in that district. Earlier seismograph work led to the drilling of the Shell Oil Company, Inc., Koth No. 1, Sec. 2, T. 16 N., R. 4 E., and the discovery of the Pinconning field, Bay County. The Koth well was completed with an initial flow of 115 barrels per hour from the Dundee formation at the depth of 2,950 feet. Subsequent wells drilled on north and south offset "forties" were dry holes.

Thirty-three wildcat wells were drilled into the basal Detroit River formation (Devonian) or deeper, and four wells, all in southeastern Michigan, reached the pre-Cambrian granite. Another well on the eastern rim of the basin penetrated the Cambrian sandstone. Table V shows the deep wildcats drilled during 1944 and the oldest formation penetrated.

TABLE V
DEEP WILDCAT TESTS

County	Well	Section Township Range	Permit Number	Total Depth	Oldest Formation Penetrated
Alcona	Pabst-Sayres 1	20-28N-9E	8404	2,298	Sylvania (Dev.)
Allegan	Hood-De Fouw 1	17-4N-15W	10786	2,175	Detroit River (Dev.)
Bay	Gulf Refining Co.—Salina 1	34-15N-4E	10551	7,976	Salina (Sil.)
Bay	Shell Oil Co.—Augustyniak 1	2-16N-4E	11192	3,790	Detroit River (Dev.)
Bay	United Drillers & Prod.—Arms 3	7-14N-6E	10850	4,130	Sylvania (Dev.)
Clare	Leonard-Rowm—Miltner 1	1-20N-6W	10145	5,205	Sylvania (Dev.)
Gladwin	Sun Oil Co.—Nash 1	31-20N-2W	10240	5,079	Detroit River (Dev.)
Hillsdale	Goodheart-Sindecuse—Salway 1	5-6S-3W	9471	2,380	Salina ? (Sil.)
Huron	Sinclair-Wyoming Oil Co.—Rink 1	24-17N-14E	10510	3,378	Sylvania (Dev.)
Isabella	Cities Service Oil Co.—Methner B-1	33-16N-3W	10630	5,205	Sylvania (Dev.)
Isabella	Pure Oil Co.—Latham 2	33-15N-6W	3946	4,994	Sylvania (Dev.)
Kalkaska	McClanahan Oil Co.—Terpening 1	8-26N-5W	10762	4,278	Sylvania (Dev.)
Lapeer	Mammoth Prod.—Welks 1	21-10N-10E	10748	3,315	Sylvania (Dev.)
Lenawee	Eckert—Taylor 1	32-8S-5E	10448	3,902	Pre-Cambrian granite
Mason	Marks & Shiffman—Carter 1	12-17N-16W	10565	3,276	Bass Island (Sil.)
Montmorency	McLellan—Miller 1	10-30N-3E	10842	2,550	Detroit River (Dev.)
Oceana	Sinclair-Wyoming Oil Co.—Vaughn 1	7-15N-15W	11129	3,400	Sylvania (Dev.)
Ogemaw	Sun Oil Co.—Holshoe 1	17-22N-4E	10836	4,537	Detroit River (Dev.)
Otsego	Rinehart & Hickok—Au Sable 6	22-30N-3W	9847	3,949	Salina ? (Sil.)
Ottawa	Ottawa Oil & Gas—Bush 1	4-9N-13W	10389	3,036	Detroit River (Dev.)
Roscommon	Sun Oil Co.—St. Helen C-1	34-22N-2W	10727	5,023	Detroit River (Dev.)
Roscommon	Sun Oil Co.—State Higgins A-1	23-24N-2W	11096	4,379	Detroit River (Dev.)
Roscommon	Sun Oil Co.—State Lyon A-1	6-24N-4W	10871	4,552	Detroit River (Dev.)
Sanilac	Herdell & Merrill—Pringle 1	2-12N-13E	10921	3,001	Detroit River (Dev.)
Sanilac	Swan—King—Marshall 1	26-9N-15E	10918	2,502	Salina (Sil.)
St. Clair	Mueller Brass—Van Antwerp 1	9-6N-17E	11001	4,948	Eau Claire (Cam.)
Tuscola	Gulf Refining—Lassiter 1	5-13N-9E	10511	4,138	Sylvania (Dev.)
Tuscola	Norton & Mell—Watrous 1	30-14N-8E	10204	4,001	Sylvania (Dev.)
Tuscola	Shell Oil Co.—Woidan 1	16-13N-11E	10968	4,194	Sylvania (Dev.)
Van Buren	Harris Oil Co.—Locker 1	13-15-15W	10550	3,007	Trenton (Ord.)
Washtenaw	Chamness—Rodenberry 1	27-18-7E	10792	6,085	Pre-Cambrian granite
Washtenaw	Colvin—Voss 1	16-15-7E	10141	6,410	Pre-Cambrian granite
Wayne	Colvin—Theison 1	16-4S-9E	10430	4,050	Pre-Cambrian granite

DEVELOPMENTS IN NORTH MID-CONTINENT IN 1944¹

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ABSTRACT

Kansas failed to produce as much oil in 1944 as it did in 1943, although the total of 101,896,704 barrels was about equal to that of 1942. This is indicative of a downward trend in production, which can be arrested only by the discovery of important new reserves. Most Kansas fields are now producing at capacity.

The Kansas exploration program in 1944 was disappointing and many of the 1943 discoveries failed to live up to expectations. The most significant discovery was the Adell pool in Sheridan County, which indicates that Lansing-Kansas City production in prolific amounts may be expected in this part of the state, despite the poor showing of the nearby Studley pool, which was discovered in 1943.

Wildcat drilling increased over the previous year. The dry hole percentage increased from 48 per cent to 50.5 per cent. Potential production per well suffered another decline, being 672 barrels compared with 900 barrels in 1943.

There were no important developments in Missouri, Iowa, or Nebraska during the year.

INTRODUCTION

The area covered in this summary includes the states of Nebraska, Missouri, and Iowa, and all of Kansas except the shallow development in southeastern Kansas. It does not include activity in Cowley or Butler counties or in the counties east of them.

KANSAS

DRILLING ACTIVITY

Kansas experienced a slight increase of drilling activity in 1944 compared with the previous year as shown in Table I.

TABLE I

	1944	Percentage	1943	Percentage	1942	Percentage
Oil wells	716	44.0	796	50.0	713	52.7
Gas wells	90	5.5	30	1.9	89	6.6
Dry holes	823	50.5	769	48.1	551	40.7
	1,629		1,595		1,353	

The figures for 1944 do not include recompleted wells. In this classification there were 24 oil wells with a potential of 13,959 barrels and 24 dry holes.

The increase in the dry-hole percentage from 48 per cent to 50.5 per cent is due to the 40-acre spacing ruling, an increase in exploratory wells, and the continued activity of new companies to drill third and fourth-rate prospects. Toward the end of the year, there was an indication that some of these companies were becoming less active in exploration and development and a few companies were terminating their oil activity. As in the past, these companies furnished much

¹ Manuscript received, April 11, 1945.

² Gulf Oil Corporation.

³ Darby and Bothwell, Inc.

valuable geological information, but failed to develop any substantial amount of oil reserves. The decline in the production of new well completions, which began in 1941, continued through 1944, as shown in Table II. This decline is due to the fact that operators are less anxious to establish inflated potentials than in previous years and to the character of the proved leases being developed.

TABLE II

<i>Year</i>	<i>Oil Wells</i>	<i>Barrels Potential</i>	<i>Barrels Average Potential</i>	<i>Gas Wells</i>	<i>Capacity in Cubic Feet</i>	<i>Average Capacity in Cubic Feet</i>
1939	983	1,548,772	1,577	62	1,280,984,000	20,661,000
1940	1,421	2,218,720	1,561	61	1,292,201,000	21,183,000
1941	1,253	1,727,593	1,379	75	797,011,000	10,626,000
1942	713	788,139	1,106	89	610,769,000	6,862,572
1943	796	716,777	900	30	320,420,000	10,680,667
1944	716	481,315	672	90	1,255,123,000	13,945,800

LEASING ACTIVITY

Many of the new pools discovered in 1944 were located in counties which had been undergoing development for some time. Accordingly, these discoveries did not promote leasing activity to any degree. An example of this is the discovery of the Adell pool in T. 6 S., R. 27 W., Sheridan County. Inasmuch as much of Sheridan and Decatur counties was already under lease, this discovery did not create a lease play. Leasing activity was carried on throughout the year in Ness, Hodgeman, and Lane counties, as the result of discoveries in Ness County. The most important new leasing occurred in Finney, Gray, and Kearny counties as the result of increased interest and activity in and around the Hugoton gas field. The lease play that occurred in Pratt and Barber counties in 1943 spread into Kiowa, Comanche, and Edwards counties in the past year.

Due to expiring leases, there was an increased activity in the taking of renewals. A few companies developed the tendency to drop many checkerboard leases, as well as blocks, which had been condemned during the year.

PRODUCTION

Kansas produced 101,896,704 barrels of oil in 1944, a decrease of 6,544,942 barrels over the yield in 1943, at that time the highest production. The daily allowable for Kansas was set at 275,000 barrels for the greater part of the year, and this figure represents the maximum rate of withdrawal according to good production practice. Unless important reserves are developed soon, this allowable will have to be reduced.

It has been estimated that the gross income from crude oil production in 1944 was about \$116,000,000. The oil industry paid out in bonuses, lease rentals, development cost, lifting cost, and dry hole exploration approximately \$84,000,000. In addition, \$14,000,000 was paid to royalty owners.

WILDCATTING

A summary of Kansas wildcat activity is given in Table III.

TABLE III
WILDCAT WELLS

No.	Footage	Chance	Sub-surface	Seismo-graph	Core Drill	Surface	Core Drill and Subsurf.	Core Drill and Seismo-graph	Surface and Sub-surface	Seismo-graph and Surface	Gravity Meter	Sub-surface and Seismo-graph
Discovery oil wells	48	164,736	9	16	8	10	0	3	0	0	0	2
Discovery gas wells	7	30,484	1	4	0	2	0	0	0	0	0	0
Dry holes	398	1,488,550	143	132	57	39	9	4	4	1	1	4
Total	453	1,683,770	153	152	65	51	9	7	4	1	1	6
OUTPOST WELLS												
Extension oil wells	6	16,876	1	5	0	0	0	0	0	0	0	0
Extension gas wells	5	44,280	1	4	0	0	0	0	0	0	0	0
Dry outpost wells	30	98,008	12	15	0	3	0	0	0	0	0	0
Total Grand total	41	159,164	14	24	0	3	0	0	0	0	0	0
	494	1,842,734	167	176	65	54	9	7	4	1	1	6

Never in the history of the Kansas oil industry have so many deep wildcat tests found so little oil. It has been estimated that approximately 25,000,000 barrels of reserve were discovered and developed by pool discoveries and extensions of known pools. None of the pools can be considered at present writing as having a proved reserve of 5,000,000 barrels.

The most encouraging development of the year was a prolific discovery of Lansing-Kansas City oil in the Adell pool in T. 6 S., R. 27 W., Sheridan County. It lies about 15 miles northwest of a 1943 discovery, the Studley pool, in T. 8 S., R. 26 W., which has proved to be mediocre. The Adell pool is of particular importance in showing that porous, oölitic zones may be expected this far northwest in Kansas. There was the customary number of new small pools and extensions on the intensively drilled part of the Central Kansas uplift. Developments near several discoveries in 1943 around the corners of Rooks, Ellis, Graham, and Trego counties have shown these pools to represent considerable reserve, but not enough wildcat wells have been drilled in the general vicinity to determine the probabilities of finding other similar pools.

The few discoveries in southern Pratt and northern Barber counties encouraged much additional development, but apparently occupy a small area and represent little reserve. Wildcatting by companies spending large portions of their war profits in Kansas resulted in no appreciable discoveries. The participation of major companies in the wildcat program continued to increase, especially in the areas of deeper drilling.

Table IV shows a comparison of wildcatting from 1938 to 1944.

TABLE IV

Year	Oil and Gas Wells	Total Feet	Dry Holes	Total Feet	Total Wells	Total Feet
1938	43	148,050	129	478,389	172	626,439
1939	21	67,259	74	258,031	95	325,290
1940	23	75,142	122	408,887	145	484,020
1941	37	140,284	290	688,189	237	828,473
1942	34	122,041	299	1,039,753	333	1,161,794
1943	57	199,532	379	1,416,605	436	1,616,137
1944	66	256,376	428	1,586,558	494	1,842,737

The average discovery well in 1944 had a depth of 3,766 feet compared with 3,500 feet in 1943. The average dry hole in 1944 was drilled 3,707 feet compared with 3,737 feet in 1943. The deepest wildcat was drilled to 6,957 feet; only twenty-one reached below 5,000 feet.

NEW POOLS

Table V lists new pools discovered in western and northeastern Kansas in 1944 as named by the nomenclature committee of the Kansas Geological Society. Twenty-four pools had only one well at the end of the year. There was a decided increase in gas development during the year, particularly in the greater Hugoton area. A notable feature was the entrance of major oil companies into the Hugoton field. Both Carter and Stanolind completed sizable extensions to the field.

Pratt and Barber counties.—The prolific Chitwood pool, discovered in 1943, was developed during the year. The rich Simpson sand "pay" in this pool stimulated endeavor to find more similar pools. Again the Lion Oil Refining Company took the lead and discovered the Coats pool in T. 29 S., R. 14 W., and somewhat later the Clara pool in T. 30 S., R. 14 W. Both are the result of core drilling. Sand conditions were not found as ideal as at Chitwood, but structural conditions more accentuated.

In the Lake City area of Barber County, an extensive gas pool has been found on the southeast flank of the broad structural "high" located at the northwest corner of the county. The pay zone is the Maquoketa dolomite, which responds readily to acid treatment. Potentials vary from 4,000,000 to 57,000,000 cubic feet.

Sheridan County.—The Continental Oil Company's core-drill policy again paid dividends when that company discovered the Adell pool during the year in T. 6 S., R. 27 W. The pool was discovered by a stratigraphic test, which encountered pre-Cambrian below Pennsylvanian. The Adell pool now has 10 producers and no dry holes and bears promise of being one of the most prolific pools in north-western Kansas. The producing zones are in the Lansing-Kansas City limestones topped at an average depth of 3,600 feet. The pool extends production 16 miles and apparently has a fairly large reserve, as indicated by the many saturated zones in the Lansing and the potentials of the completed wells.

DEVELOPMENTS IN NORTH MID-CONTINENT IN 1944 705

TABLE V
WESTERN KANSAS POOLS, 1944

Pool	County	Sec.-T.-R.	Total Depth (Feet)	Producing Formation	Method of Exploration	Potential (Barrels)
Adell	Sheridan	11-6S-27W	4,044	Lans.-K.C.	Core drill	840
Alda	Graham	15-7S-22W	3,854	Lans.-K.C.	Core drill	518
Alford	Kiowa	14-30S-19W	5,100	"Miss. lime"	Core drill	3,000,000 gas
Arnold	Ness	22-16S-25W	4,563	"Miss. lime"	Core drill	142
Beisel	Russell	15-14S-12W	3,284	Arbuckle	Subsurface and Core drill	81
Bloomer, E.	Ellsworth	18-17S-10W	3,332	Arbuckle	Chance	100
Brock	Stafford	12-23S-12W	3,685	Arbuckle	Seismograph	330
Cadman	Stafford	4-25S-13W	4,072	Viola	Chance	25
Carroll	Barton	21-17S-14W	3,370	Arbuckle	Chance	150 est.
Catherine, NW	Ellis	4-13S-17W	3,614	Arbuckle	Chance	50
Clara	Barber	2-30S-14W	4,610	Arbuckle	Core drill	6,000,000 gas
Claussen	Russell	27-12S-14W	3,155	Lans.-K.C.	Subsurface	10
Clearwater	Sedgwick	22-29S-2W	3,036	Lans.-K.C.	Subsurface	207
Coats	Pratt	24-29S-14W	4,420	Simpson	Core drill	714
Doran, W.	Rice	14-19S-10W	3,278	Arbuckle	Subsurface	136
Drach, NW.	Stafford	11-22S-13W	3,746	Arbuckle	Chance	16
Ellis, NW.	Trego	26-12S-21W	3,936	Arbuckle	Seismograph and Sub-surface	242
Feltes, N.	Barton	2-16S-12W	3,344	Arbuckle	Chance	25
Gypsum Creek	McPherson	4-17S-1W	2,629	"Miss. lime"	Subsurface	75
Hargis	Barber	3-31S-14W	4,420	Viola	Chance	4,000,000 gas
Hobart	Rooks	33-8S-18W	3,452	Lans.-K.C.	Core drill	708
Jenday	McPherson	1-19S-2W	3,006	"Miss. lime"	Chance	100
Jenday, S.	McPherson	7-19S-1W	3,491	"Miss. lime"	Core drill and Subsurface	100
Kansada	Ness	23-17S-26W	4,461	"Miss. lime"	Core drill	130
Lerado, SW.	Reno	21-26S-9W	4,188	Viola	Subsurface	93
Ludwick	Pratt	4-29S-13W	4,530	Simpson	Core drill and Subsurface	142
Marjorie	Barber	31-30S-13W	4,550	Viola	Subsurface	47,000,000 gas
Marjorie, E.	Barber	32-30S-13W	4,670	Viola	Subsurface	34,500,000 gas
McCandless	Stafford	30-25S-13W	4,323	Simpson	Seismograph	734
Mentor	Saline	13-15S-3W	3,506	Viola	Seismograph	77
Orth, W.	Rice	21-18S-10W	3,270	Arbuckle	Subsurface	88
Pawnee Rock, NE.	Barton	7-20S-15W	3,781	Arbuckle	Core drill	1,270
Pawnee Rock, S.	Pawnee	25-20S-16W	3,830	Arbuckle	Subsurface	362
Peach	Barton	25-16S-14W	3,441	Arbuckle	Subsurface	140
Pleasant	Ellis	2-14S-20W	3,852	Reagan	Seismograph	563
Pritchard	Barton	34-20S-14W	3,445	Arbuckle	Seismograph and Sub-surface	1,526
Richland	Stafford	27-24S-14W	4,240	Arbuckle	Seismograph	221
Rattlesnake, W.	Stafford	11-24S-14W	3,770	Lans.-K.C.	Subsurface	254
Reif	Barton	30-16S-12W	3,264	Arbuckle	Chance	291
Sand Hills	Stafford	19-21S-11W	3,554	Arbuckle	Subsurface	12
Schmeidler	Ellis	28-12S-17W	3,643	Arbuckle	Chance	88
Shriver	Pratt	33-29S-14W	4,600	Simpson	Core drill	344
Skinner, NW.	Barber	17-31S-14W	4,375	Viola	Subsurface	57,000,000 gas
Skinner, S.	Barber	32-31S-14W	4,053	Douglas	Subsurface	3,000,000 gas
Smyres, N.	Rice	23-19S-6W	3,384	"Miss. lime"	Subsurface	15

TABLE V—Continued

Pool	County	Sec.-T.-R.	Total Depth (Feet)	Producing Formation	Method of Exploration	Potential (Barrels)
St. John Townsite	Stafford	33-23S-13W	3,924	Arbuckle	Seismograph	2,359
St. Peter	Barton	5-19S-11W	3,407	Arbuckle	Subsurface	350
Stucky, S.	Harvey	10-23S-3W	3,376	"Miss. lime"	Subsurface	2,000,000 gas
Vacek	Ellsworth	32-15S-10W	3,320	Arbuckle	Subsurface	101
Workman	Barton	33-20S-12W	3,455	Arbuckle	Subsurface	221
Younger	Ellis	6-14S-17W	3,583	Arbuckle	Seismograph	50
Zurich Townsite	Rooks	27-9S-19W	3,668	Arbuckle	Seismograph	1,326
Zyba, SW.	Sumner	22-30S-1W	3,929	Simpson	Subsurface	210
NORTHEASTERN KANSAS POOLS						
Livengood	Brown	3-1S-15E	2,590	Hunton	Core drill	110

Stafford County.—One of the best seismograph discoveries of the year was the St. John Townsite pool. The discovery well is the Stanolind Oil and Gas Company's Delker No. 1, in Sec. 34, T. 23 S., R. 13 W., and the pay zone is the Arbuckle dolomite. Two other discoveries credited to seismograph were discovered by the Atlantic Refining Company—the Richland pool in T. 24 S., R. 14 W., and the McCandless pool in T. 25 S., R. 13 W. The former pool produces from the Arbuckle dolomite topped at 3,912 feet and the latter from the Simpson sand at 4,280 feet.

Ness County.—The Skelly Oil Company completed a small well in the Mississippian limestone in T. 17 S., R. 26 W., the top of the formation being found at 4,449 feet. The pool does not promise to be a large reserve, but it has stimulated wildcatting to the west and northwest.

Meade County.—One of the most interesting rank wildcats of the year is the Stanolind's Adams No. 1, in Sec. 8, T. 35 S., R. 30 W., a short distance north of the Oklahoma line. The test is drilling on a large ranch after extensive core drilling. It is carried as a mystery well, but toward the end of the year the Stanolind released information to 6,110 feet, a point 255 feet below the top of the Mississippian limestone. A drill-stem test has indicated that gas has been struck. The test was drilling ahead for the Arbuckle dolomite at the end of the year.

MISSOURI AND IOWA

The Forest City basin play in northwest Missouri was confined to the drilling of five wildcats in Atchison and Holt counties. There were no new discoveries and the five tests drilled a total of 8,702 feet only. Two of the five were drilled to the Hunton limestone, found at an average depth of 2,100 feet in this area. The Cities Service Oil Company continued to develop its Cherokee sand field in Atchison County, known as the Tarkio pool.

Only one well, in southwestern Iowa, was drilled for oil. It was Hunt's Mon-

celle No. 1, Sec. 26, T. 79 N., R. 29 W. The test is a mystery well, but it is thought that the St. Peter sand was tested at approximately 2,000 feet.

NEBRASKA

For the third successive year, wildcat drilling in Nebraska was unsuccessful. Sixteen dry holes were completed, 6 in the western ranges and 10 in the eastern ranges. The total footage of the west ranges was 27,664 feet and of the east ranges 16,357 feet. The geological background of these tests is: stratigraphic 8, chance 5, acreage 3. Geophysical exploration was at a minimum during the year. Major companies, which drilled the stratigraphic tests, released samples and information on the tests toward the end of the year.

Table VI gives a summary of Nebraska wildcats in 1944.

TABLE VI
1944 WESTERN NEBRASKA WILDCATS

County	Sec.-T.-R.	Operator and Farm	Total Depth (Feet)	Formation	Method
Dundy	28-1N-30W	Stanolind's Strat. test 12	3,585	Permian	Stratigraphic
Red Willow	20-2N-30W	Stanolind's Strat. test 13	4,250	Pre-Cambrian	Stratigraphic
Hitchcock	35-2N-33W	Texas' Redmer	4,704	Basal sand	Acreage
Hitchcock	22-2N-35W	Texas' Taunton	4,663	Arbuckle	Acreage
Hitchcock	20-4N-35W	Texas' Egle	5,015	Arbuckle	Acreage
Garden	33-19N-42W	Sinclair Prairie's Delatour	5,446	Pre-Cambrian	Stratigraphic
1944 EASTERN NEBRASKA WILDCATS					
Richardson	34-3N-15E	E. S. Towle's Fritz	2,570	Hunton	Chance
Richardson	13-3N-16E	Lee Bates' Caverzogie	2,644	Hunton	Chance
Johnson	8-5N-12E	Stanolind's Strat. test 8	980	Pre-Cambrian	Stratigraphic
Johnson	16-5N-12E	Stanolind's Strat. test 9	882	Pre-Cambrian	Stratigraphic
Johnson	20-5N-12E	Stanolind's Strat. test 7	859	Pre-Cambrian	Stratigraphic
Nemaha	23-6N-13E	Dan Short's Gauchat	1,970	Hunton	Chance
Otoe	21-7N-12E	Woodward's Wendlin	1,158	Pre-Cambrian	Chance
Otoe	3-9N-12E	Stanolind's Strat. test 10	1,171	Pre-Cambrian	Stratigraphic
Otoe	7-9N-12E	Stanolind's Strat. test 11	1,634	Pre-Cambrian	Stratigraphic
Butler	29-16N-2E	Bellwood Syndicate's Nicolas	2,489	Pre-Cambrian	Chance

Development of producing areas in Nebraska ceased in 1943. The cumulative production in Nebraska to January 1, 1945, was approximately 4,511,740 barrels, of which 3,552,156 barrels were produced in the Falls City pool from 57 wells. The Barada pool has produced 739,019 barrels from 16 wells, the Dawson pool 112,758 barrels from 12 wells, and the Schubert pool 107,807 barrels (no production in 1944) from 10 wells. Of the 95 producing wells, only 73 are now producing.

DEVELOPMENTS IN OKLAHOMA IN 1944¹

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ABSTRACT

Crude-oil production in Oklahoma totalled 124,219,383 barrels in 1944, an increase of 2½ million barrels, or 2.1 per cent against a national increase of 11.6 per cent. Proved reserves are estimated by the A.P.I. Committee on Reserves to be 970,262,000 barrels, an increase of 61,644,000 barrels, or 6.8 per cent, against a national increase of 1.9 per cent.

There were 1,890 wells drilled during 1944, an increase of 703, or 59 per cent, against a national increase of 27 per cent. The drilling of 1,890 wells resulted in the discovery of 36 new oil fields, 8 new gas fields, and 58 extensions and new producing formations. Most of the new discoveries are small and are of little importance in increasing reserves. The most important feature of the year is the unchecked development of the West Edmond (Hunton oil) field.

Geophysical activity was limited to seismograph and gravimeter, with a considerable increase in both types of work. The number of core holes drilled was more than doubled, but stratigraphic holes decreased in number. The surface mapping reported is nearly 3 times as much as 1943.

INTRODUCTION

Oklahoma's position as an oil-producing state improved during the year 1944. Production and reserves both increased for the first time in several years, the rate of drilling increased and the rate of discovery was maintained. Oklahoma ranks fourth in both production and reserves, but with a 6.8 per cent increase is first in the percentage rate of increase in reserves. Texas and California each increased their reserves less than one per cent. Louisiana increased her reserves 6 per cent while Kansas, fifth ranking state in production, suffered a 6.8 per cent decrease in reserves. In January, 1944, Oklahoma produced 9,977,576 barrels, in June 10, 022,784 barrels, in December 11,008,663 barrels of crude oil.

All evidence indicates that Oklahoma's position has improved in 1944 and will continue to improve in 1945.

DEVELOPMENT

Oklahoma increased her production of crude oil by 2½ million barrels in 1944, producing 124,219,383 barrels³ against 121,697,740 in 1943. This is an increase of 2.1 per cent whereas national production increased 11.6 per cent. Proved reserves also increased 61,644,000 barrels over last year, the API figure for Oklahoma as of December 31, 1944, being 970,262,000 barrels. Oklahoma is credited with the discovery of 186,391,000 barrels of oil, of which 20,844,000 barrels are assigned to new discoveries, and the remaining 165,547,000 barrels to extensions and revisions.

¹ Manuscript received, March 14, 1945.

² Pure Oil Company. The assistance of numerous companies and individuals in supplying data, checking information, typing and proof-reading the manuscript, *et cetera*, is acknowledged and appreciated. Insofar as possible, companies have been given the opportunity to check data as published on their wells.

³ State and county production figures are taken from the Oklahoma Corporation Commission report of Pipe Line Runs for 1944.

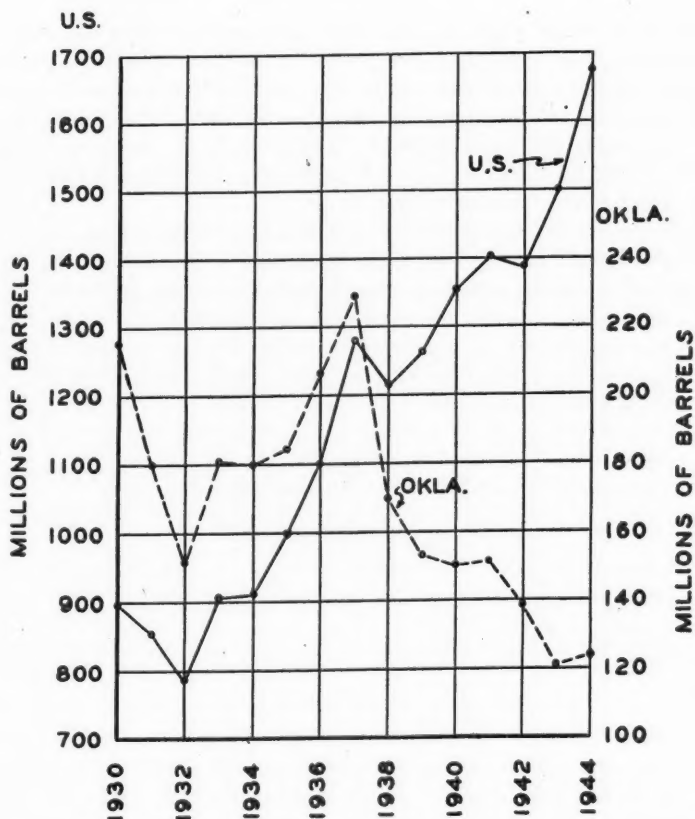


FIG. 1.—Graph showing relation of Oklahoma production to national production, 1930-1944.

TABLE I
COMPARATIVE PRODUCTION OF SIX LEADING COUNTIES

County	Production 1944	Percentage	Production 1943	Percentage
Oklahoma	24,916,441	20.1	22,074,490	18.1
Seminole	14,452,991	11.6	15,988,282	13.1
Osage	10,382,006	8.4	10,847,816	8.9
Creek	8,323,136	6.7	7,750,060	6.4
Carter	7,850,827	6.3	7,923,029	6.5
Caddo	6,483,328	5.2	4,881,542	4.0

One fifth of all Oklahoma oil was produced in Oklahoma County, where the decline in the Oklahoma City field was more than offset by the 8 million barrels

produced in the West Edmond pool. Table I lists all counties in the state which have averaged above 500,000 barrels production per month. Over 50 per cent of the state's total production was produced by the five leading counties, as in the past several years. It is of interest to note, however, that of the six counties listed in the 500,000-barrels-per-month group, three actually produced less oil than in 1943. Caddo County, with a 33 per cent increase, has replaced Pottawatomie county, which suffered a 24 per cent decrease.

The increase of $2\frac{1}{2}$ million barrels of oil and $61\frac{1}{2}$ million barrels of proved reserves was made by drilling 1890 wells, an increase of 703 wells, or 59 per cent, over 1943. This increase in drilling is not reflected in the discoveries for the year, there being a total of 44 new pools, which is just the same as in 1943. The total number of exploratory wells was increased only from 336 to 345. The ratio of discoveries to wildcats drilled improved slightly, from 1 discovery to 6.8 wildcats in 1943 to 1 discovery to 6.5 wildcats in 1944.

TABLE II
COMPARATIVE BREAK-DOWN OF WELLS DRILLED

	<i>Total</i>	<i>Exploratory Wells</i>					<i>Total</i>	<i>All Others</i>
		<i>Oil</i>	<i>Gas</i>	<i>Dry</i>	<i>Ext.</i>	<i>N.Fm.</i>		
1944	1890	36	8	244	30	27	345	1545
1943	1187	34	10	254	23	15	336	938

DISCOVERIES

The rate of discovery of new oil and gas pools was not increased in 1944, in spite of a 59 per cent increase in the number of wells drilled. Exploratory wells were increased only from 336 to 345, an increase of 2.7 per cent. The resultant discovery of 36 new oil fields and 8 new gas fields gives an overall total of new discoveries just equal to 1943. Table III which lists 102 discoveries for the year, including 31 extensions to old fields and 27 new producing formations, indicates that most of the discoveries are of little importance for additional development. Nine of the 44 new pools may develop into fields of some importance. The more important pools are briefly described in the following account.

WEST EDMOND POOL

Although discovered in 1943 and discussed in last years report,⁴ the phenomenal growth of this field necessitates a statement in the 1944 review. On December 31, 1943, there were 15 completed wells and 31 drilling wells. On December 31, 1944, there were 325 producers, 13 dry holes, 117 drilling wells, and 57 loca-

⁴ J. L. Borden, "Developments in Oklahoma in 1943," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 28, No. 6 (June, 1944), p. 780.

TABLE III
NEW POOLS—EXTENSIONS AND FORMATIONS DISCOVERED DURING 1944

Index No.	Location	County	Field	Type	Operator	Form	Date	Producing Formation	Depth (Feet)	Total Depth	Plug Back	Initial Production	Development	Method Exploration
1	13-26-1W	Kay		N. Fm.	Lynn	School	6-5	Miss.	3,901	3,928	P. 22 oil-10 Wtr.		I	
2	2-25-2W	Kay		New	Jenkins	Peoples Est.	7-7	Miss.	4,355	4,375	9,000 M. Gas		1-1 drlg.	Sub.
3	12-24-8	Kay	Naval Res.	N. Fm.	Dunn & Miller	Lehigh	1-28	Articulate	4,355	4,375	300 S.P. 26		I	Sub. & Sub.
4	13-22-12	Tulsa		New	Kimball & Evans	Switzer	11-4	Burgess	1,512	1,530	40		I	Sub.
5	1-21-1	Noble	W. Sumner	New	Gulf	Janita	1-24	2d "Wilcox"	4,590	4,598	463 & 72 Wtr.		2-3 dry	Seis.
6	33-21-6	Pawnee	Marmec	Ext.	Sunray	Ryan	11-24	Honey	2,777	3,338	2,745 S.P. 26		1-1 dry	Sub.
7	35-20-11	Osage		New	Peters	Osage 2	10-2	Huminy	2,416	2,535	2,495		I	Sub. & Sub.
8	10-19-4	Payne	NW. Ingalls	New	Amerada-Stanolind	School Tract	3-27	2d "Wilcox"	4,933	4,941	Fl. 144		I	Seis.
9	22-10-4	Payne	Ingalls	N. Fm.	Skelly	Barry 3	7-24	Huntton	3,797	4,135	3,917 Pt. P. 76-8 Wtr.		1-1 dry	Sub.
10	10-10-5	Payne	W. Yale	N. Fm.	Sun	Morgan	2-21	2d "Wilcox"	3,579	3,678	3,026 Fl. 30 oil-20 Wtr.		1-1 dry	Seis.
11	25-10-4	Payne	E. Ingalls	N. Fm.	Blackwell	Penny	2-7	Red Fork	3,280	3,761	3,330 Pt. 4,200 M. gas		I	
12	25-10-4	Payne	E. Ingalls	N. Fm.	Crosbie	Myatt "B"	3-13	Miss.	3,625	3,848	Pt. A.P. 6		I	Sub.
13	12-18-3W	Payne	SE. Lehigh	N. Fm.	Sunray	Mckensie	5-1	Layton	2,307	4,100	Fl. 240		2	Sub.
14	12-18-3W	Payne	SE. Lehigh	N. Fm.	Kelly	Conner	9-15	Dutcher	4,255	4,255	Fl. 251		1-1 drlg.	Sub.
15	17-18-10	Creek	Kellyville	Ext.	Buckles	Conner	2-28	Layton	4,770	4,770	Fl. 25 Fl. 81		3-2 dry	Seis.
16	22-17-3W	Logan	E. Crescent	New	Gulf	Pritchard	10-23	Layton	4,608	6,430	4,770 S. Fl. 90		1-1 drlg.	Sub.
17	12-17-3W	Logan		New	Eason	Michael	10-23	Layton	4,910	4,997	3,950 Rip 2,000		I	
18	19-17-8	Creek	Cushing	N. Fm.	Big Four	Cubbe 4	8-8	Penn. sd	2,965	3,900	1,000 M. Gas		I	
19	35-16-12	Oklmulgee	Pollyanna	N. Fm.	Long Service	Anthony	12-13	Bois D'Arc	1,048	1,082	6,497 A. Fl. 420		I	
20	32-15-1W	Logan	W. Edmond	Ext. Gas	Phillips	Gavin	12-27	Bois D'Arc	6,764	6,857	7,056 Pt. Fl. 130		2-3 dry	
21	32-15-1W	Logan	W. Edmond	Ext.	Phillips	Collett	12-27	Bois D'Arc	6,085	7,283	2,643 S.P. 50		I	
22	25-15-3W	Kingfisher	Hickory Grove	Ext.	Anderson-Pritchard	Watson	8-10	Prue	2,616	3,070	3,842 S.P. 50		I	
23	34-15-7	Creek	Dewey	N. Fm.	Sinclair-Prairie	Narchubby	5-20	"Wilcox"	3,835	3,840	Fl. 1250		I	
24	26-15-8	Creek	NE. Arcadia	N. Fm.	Springer & Bates	Williams	7-3	2d "Wilcox"	5,980	5,997	Pt. P. 12-20 Wtr.		4 oil-3 dry-4 drlg.	
25	11-14-1W	Oklahoma		New	Jordan	Bourne	5-17	Simp. dol.	5,794?	5,959	4,247 Fl. 73		3-1 dry	
26	14-14-1W	Oklahoma	NE. Arcadia	New	Jordan	Bourne	5-17	Simp. dol.	5,794?	5,959	4,247 Fl. 73		3-1 dry	
27	1-14-3	Lincoln	Chandler	Ext.	Great Lakes	Gibson	2-7	Skinner	4,249	5,140	6,008 S.P. 16		I	Seis.
28	12-14-3W	Oklahoma	N. Edmond	New	Phillips	Olmsstead	6-10	Bartlesville	5,972	6,524	Pt. Fl. 138		2	
29	28-14-3	Lincoln	SE. Warwick	New	Sinclair-Prairie	Danker	11-6	Cleveland	3,475	5,250	A. Fl. 1170			
30	3-14-4W	Oklahoma	W. Edmond	Ext.	Cities Service	Snyder 2	12-26	Chimneyhill	6,709	6,878	Fl. 141			
31	7-14-4W	Oklahoma	W. Edmond	Ext.	Soho	Williams B	5-8	Bois D'Arc	6,922	7,072	A. Fl. 1604			
32	9-14-4W	Oklahoma	W. Edmond	Ext.	Phillips	Coder	7-17	Bois D'Arc	6,588	6,608	A. Fl. 1285			
33	16-14-4W	Oklahoma	W. Edmond	Ext.	Phillips	Gomer	7-10	Bois D'Arc	6,660	6,746	A. Fl. 400*			

Index numbers refer to Figure 2.
Under "Type": New—new discovery, N. Fm.—new producing formation, Ext.—extension to pool, New Gas—first gas well in old oil area.
Under "Initial Production": Pl.—perforated, Fl.—flowed, P.—pumped, A.—acidized, S.—shot.
* Estimated I.P. based on 1- or 2-hour flow.

TABLE III—Continued

Index No.	Location	County	Field	Type	Operator	Form	Date	Producing Formation	Depth (Feet)	Total Depth	Plug Back	Initial Production	Development	Method Exploration
34	19-14-4W	Oklahoma	W. Edmond	Ext.	Fox & Fox	Peterson	2-28	Bois D'Arc	6,870	7,010	Pt. A. Fl.	1500*		
35	21-14-4W	Oklahoma	W. Edmond	Ext.	Continental	Casey	7-24	Bois D'Arc	6,591	6,705	Pt. A. Fl.	1200*		
36	27-14-4W	Oklahoma	W. Edmond	Ext.	Stanolind	Paula	11-20	Bois D'Arc	6,518	6,807	Pt. A. Fl.	1200*		
37	28-14-4W	Oklahoma	W. Edmond	N. Fm.	Peppers	McDowell 2	8-7	Chimneyhill	6,838	7,000	Pt. A. Fl.	60		
38	28-14-4W	Oklahoma	W. Edmond	Ext.	Peppers	Crookham	3-13	Bois D'Arc	6,680	6,820	Pt. A. Fl.	300		
39	34-14-4W	Oklahoma	W. Edmond	Ext.	Denver	Holmes	8-21	Bartlesville	6,498	7,337	S. Fl.	27		
40	25-14-5W	Canadian	W. Edmond	Ext.	Dickey	Young	2-8	Bois D'Arc	6,982	7,111	Pt. A. Fl.	6,545		
41	36-14-5W	Canadian	W. Edmond	Ext.	Gutowaky	Wilson	6-12	Bartlesville	6,845	6,996	S. Fl.	44		
42	8-14-6	Lincoln	W. Edmond	New	Anderson-Prichard	Elkenberry	9-11	Prue	3,207	3,254	2,000 M. Gas	1		Sub.
43	14-14-7	Creek	W. Edmond	New	Sinclair-Frairie	Goff	7-17	Bartlesville	3,111	3,232	1,900 M. Gas	1		Sub.
44	16-14-7	Creek	W. Edmond	N. Fm.	Crosbie	Deming	9-24	Layton	1,538	1,830	10,000 M. Gas	2		Sub.
45	6-14-8	Creek	W. Edmond	New	Nadel & Gusman	Sandlin	9-2	Prue	2,450	3,922	2,490	2		Sub.
46	2-14-9	Creek	W. Edmond	New	Buell	Davidson	5-18	Kinner	2,440	2,464	P. 35	68		Sub.
47	12-14-10	Creek	W. Edmond	New	Anderson-Prichard	Bois D'Arc	6-12	Bois D'Arc	6,553	7,062	Pt. A. Fl.	1700*		
48	17-13-4W	Oklahoma	W. Edmond	Ext.	Magnolia	Talbot	10-23	Bois D'Arc	6,941	7,109	Pt. A. Fl.	2500*		
50	7-13-7	Oklahoma	W. Edmond	New Oil	North. Ordance	Klabzuba	2-28	Red Fork	3,276	4,139	S. Fl.	127		Sub.
51	10-12-7	Oklahoma	W. Edmond	New	Phillips & Keryn	Fixico	9-25	Dutcher	3,730	4,557	Pt. A. Fl.	38 oil		Sub.
52	28-12-9	Oklahoma	E. Castle	New	Texas	Tanner	3-20	Cromwell	3,273	4,056	Pt. A. Fl.	335		Seis.
53	17-12-10	Oklahoma	Morse	New	Doak & Hughes	Long	8-28	Cromwell	3,175	3,195	S. P. 10	1		Sub.
54	35-12-10	Oklahoma	Blakely	Ext.	McBride	Brooks Heirs	1-2	Cromwell	3,066	3,081	S. Fl.	95		Sub.
55	13-11-4	Pottawatomie	NE. Shawnee	N. Fm.	Atlantic	Orr 3	3-7	2d "Wilcox"	4,810	4,840	Pt. S. Fl.	750		Seis.
56	15-11-9	Oklahoma	Greenlease	New	Phillips & Kubat	Whitehead	10-2	Hutton	3,850	4,123	Pt. A. Fl.	135		Seis.
57	31-11-10	Oklahoma	Wilcox	Ext.	Wilcox	Wind	12-20	Dutcher	2,920	2,960	2,580 M. Gas	1		Sub.
58	11-10-1W	Cleveland	Deep Rock	N. Fm.	Deep Rock	Harris	10-18	Bartlesville	5,937	6,693	Pt. A. Fl.	1700*		Seis.
59	26-10-3W	Cleveland	S. Moore	N. Fm.	Mid-Continent	Brand	12-18	Bartlesville	7,740	9,219	Pt. Fl.	750		Seis.
60	26-10-3W	Cleveland	S. Moore	New	Mid-Continent	Westermier	7-10	2d "Wilcox"	8,825	9,902	Pt. Fl.	757		Seis.
61	32-10-3W	Cleveland	W. Moore	N. Fm.	Mid-Continent	Harris "B"	10-9	Hutton	8,005	8,875	Pt. A. Fl.	1		Seis.
62	28-10-7	Seminole	Cheyurha	New	Gulf	Duley	1-31	Booch	3,435	3,563	S. Fl.	158		Sub.
63	35-10-7	Seminole	N. Bethel	N. Fm.	Amerada	Wood	3-13	Gilcrease	3,555	4,679	Pt. Fl.	138		Sub.
64	1-10-8	Oklahoma	Kewanee	Ext.	Kewanee	Marshall	10-9	Misener	3,974	4,057	Pt. A. Swb.	1		Seis.
65	13-0-2	Pottawatomie	S. Centerpoint	New	Cities Service	Com.	11-27	Hutton	4,046	5,798	Pt. 15-50 Wtr.	1		Seis.
66	14-9-9	Hughes	Hughes	New	Phillips	Barbour	8-7	Gilcrease	2,533	3,168	Pt. 1-47	1		Seis.
67	14-9-10	Hughes	Hughes	New	Phillips	Barbour	8-7	Gilcrease	2,533	3,168	Pt. 1-47	1		Seis.
68	35-0-10	Hughes	Hughes	New	Creekmore & Rooney	Dannenburg	4-3	Cromwell	3,168	3,172	FL 408	1-4 dry		Seis.

TABLE III—Continued

Index No.	Location	County	Field	Type	Operator	Farm	Date	Producing Formation	Depth (feet)	Total Depth	Plug Back	Initial Production	Development	Method Exploration
69	5-2-12	Hughes	West Noble	N. Fm.	I. E. Hall	Griswald	3-13	Booth	1,034	1,057	8,200	3,500 M. Gas	1	Sub.
70	3-2-12	McClain		New	Carter	Johnson	11-15	Granite wash	8,100	8,122	8,200	Pt. A. Fl. 322	1-1 drlg.	Seis.
71	8-8-20W	Washita		New	Gulf	Hopkins	3-13	Granite wash	5,540	9,971	6,501	Fl. 307-40	3-3 drlg.	Seis.
72	4-7-3W	McClain	Washington	New	Carter	Cottingham	5-29	"Wilcox"	10,635	11,209	10,863	Pt. A. Fl. 207	2-2 dry-	Seis.
73	9-7-3	Pottawatomie	N.E. Moral	New Oil	Stanolind	Werrill	4-17	Hunton	4,537	4,887	4,550	Pt. A. Fl. 346	2 drlg.	Seis.
74	7-7-10	Hughes	N. H. Corner	New	Deep Rock	Myers	3-27	Cromwell	3,357	3,590		Fl. 387	3-1 dry	Seis.
75	10-7-13	Pittsburg		New	Public Service	Horton	8-14	Hartsborne	2,360	2,552		1,000 M. Gas	1	Sub.
76	10-7-17W	Kiowa	N.E. Hobart	New	Texas	Pure	12-30	Springer	1,728	1,784		Fl. 1056	1	Sub.
77	28-6-3	Pottawatomie		Ext.	Texas	Vestal	12-20	Layton	2,854	4,463	3,120	Pt. Est.	2 gas	Sur. & Seis.
78	6-6-6	Seminole		N. Fm.	B. & M.	Mathis	7-10	Francis	1,195	3,125		15,000 M. Gas	1	Sub.
79	27-6-8	Hughes	NW. Hawkins	New	Ashland	Smith	9-7	Booth	2,631	3,613	2,680	S.P. 10 oil	1 gas-2 dry	Sub.
80	23-5-5	Seminole		Ext.	Skelly Shaw	Swan	12-11	Hunton	2,260	2,460		A. P. 15	1	Sub.
81	32-5-6	Pontotoc		New		Logsdon	10-31	Cromwell	1,781	1,920		Pt. 8,500	2-1 dry	Sub.
82	17-5-8	Pontotoc		N. Fm.	Sunray	Jonas	7-3	Simp. dol.	3,912	4,087		A. P. 15	2	Seis.
83	16-8W	Gady		N. Fm.	O.N.G.	Rider	7-10	Pontotoc	3,105	6,270	3,356	Pt. 60 oil	1	Seis.
84	21-5-11	Hughes		Ext.	Stanolind	Clarke	7-24	Cromwell	5,463	5,756	5,576	Pt. 44,000 M. Gas	1-2 drlg.	Seis.
85	28-4-7W	Garvin	W. Pauls Valley	New	Continental	Parks	7-3	Viola	4,401	4,890		Pt. A. Fl. 20	1	Seis.
86	4-4-3	Garvin	McGee	New	Skelly-Tide Water	Katestraw	12-20	Penn. sd.	2,490	3,401	2,525	Pt. A. Fl. 110	1	Seis.
87	33-4-9	Hughes		New	Northern Ordnance	Hamilton	1-10	Cromwell	4,226	4,231		32,000 M. Gas	1	Seis.
88	13-3-1	Garvin	E. Pauls Valley	New Oil	Ramsay	McDowell	2-14	Penn. sd.	2,900	3,350		Pp. 31	3-7 dry	Seis.
89	18-3-2	Garvin	E. Pauls Valley	Ext.	Ohio	McKinney	5-19	Penn. sd.	2,866	2,892		Fl. 265	15 drlg.	Seis.
90	20-3-3	Garvin	Lewis	New	Sinclair Prairie	Allred	10-2	Bromide sd.	1,897	1,919		Pp. 105	3-3 dry-	Seis.
91	16-2-8W	Stephens	W. Marlow	New Gas	Texas	Cooper	7-2	Penn. sd.	4,743	6,396	5,290	Pt. 0.240 M. Gas	1	Seis.
92	28-2-9	Coal	Centrahoma	Ext.	Phillips	Payton	5-10	Cromwell	4,978	5,205	5,095	S. M. 100	1 gas	Seis.
93	13-1-1W	Garvin	NW. Hoover	N. Fm.	Delaney	Russell	8-16	Penn. sd.	1,335	1,474	1,399	Fl. 5	6-7 dry	Seis.
94	13-1-1W	Garvin	NW. Hoover	N. Fm.	Delaney	Russell 2	8-9	Pontotoc	1,902	1,990		P. 10	2	Seis.
95	14-1-1W	Garvin	NW. Hoover	New	Helmerich & Payne	Freeman	7-3	Penn. sd.	1,107	1,120		Fl. 120	6	Seis.
96	36-1-13ECM	Texas	Hugoton	Ext.	Phillips	Nina	7-26	Penn. ls.	2,885	2,970		A. 27,300 M. Gas	1	Seis.
97	16-13-3W	Carter	Tussey	Ext.	Texas	Pennington	3-6	Penn. sd.	2,730	2,789		Pt. Fl. 215	14-1 gas-	Seis.
98	31-2-2W	Carter	Graham	N. Fm.	Continental	Fowler 1-A	10-29	Chimneyhill	5,410	8,248	5,470	Pt. A. Fl. 450	1	Seis.
99	26-3-1	Carter	Caddo	Ext.	Pure	Taylor	7-5	Bromide sd.	5,348	5,371		Fl. 564	1-1 drlg.	Seis.
100	21-3-2W	Carter	Wheeler	N. Fm.	Samedan	Revelle	7-24	Penn. sd.	5,056	6,505	5,196	Pt. P. 30	1	Seis.
101	5-5-1W	Carter	SW. Lone Grove	New	Texas	Chubbe	5-29	Penn. sd.	2,700	2,789		Fl. 2143	16-4 dry-	Seis. & Sub.
102	6-5-1W	Carter	SW. Lone Grove	N. Fm.	Samedan	Dolman D	8-21	Penn. sd.	3,581	3,818		Pt. Fl. 130	1	Seis.

tions. The trade journals have stated that the field contains the greatest concentration of drilling equipment in the United States. The field is 12 miles from the northern to the southern extremes of production, and about 3 miles wide. This area encompasses more than 14,000 acres of proved production.

The Bois de Arc limestone (Devonian phase of the Hunton) is the main producing formation, with secondary production from the Bartlesville sand (Pennsylvanian) and the Chimneyhill limestone (basal Hunton-Silurian). No Ordovician oil has been found in the three wells which have reached the "Wilcox." Production to January 1, 1945, totalled about 8,075,000 barrels, and estimates of ultimate recovery run as high as 300,000,000 barrels. Ultimate per acre recovery is estimated at 7,000 barrels, but runs as high as 20,000 barrels for some leases. The No. 1 Wagoner, discovery well, is estimated to have produced 202,850 barrels of oil to January 1, 1945.⁵ Daily allowable is 42,000 barrels, the largest for any individual field in Oklahoma.

Several wells on the southwest flank of the field produce salt water at subsea depths between 5850 and 6000 feet. There is a post-Hunton stream channel or canyon about one location wide extending across the field in the southern part of T. 14 N., R. 4 W. Wells drilled in this channel fail to find the Bois de Arc, or productive phase of the Hunton, and are dry unless productive in the Bartlesville.

Definite boundaries of the field are not established and its ultimate extent is unknown.

CHEYARHA POOL

The discovery well for the Cheyarha pool was the Gulf Oil Corporation's Duley No. 1, SE. $\frac{1}{4}$, SE. $\frac{1}{4}$, SE. $\frac{1}{4}$ Sec. 28, T. 10 N., R. 7 E., Seminole County, completed in January in the Booch sand. Originally drilled to 3563 feet to test the Cromwell sand, it was plugged back to 3443 feet, and shot with 30 quarts of nitro-glycerine between 3429 and 3441 feet. The 2-inch tubing was run and the well flowed 158 barrels of 39.9° gravity oil in 24 hours. At the close of the year there were 16 producing wells, 1 dry hole, and 3 drilling wells. Production has been established in four sections, with all but one of the producing leases held by the Gulf. All production is from the Booch sand, which is about 30 feet thick. The largest initial production reported is 444 barrels through open tubing after 185-quart dump shot. Three wells were completed making only gas, the largest gauged at 5,000,000 cubic feet daily. Two edge wells, one on the east and one on the west, produced some water on completion.

Four wells have tested the Cromwell, which in all cases has yielded salt water. No well has gone below this horizon.

Discovery was based on a subsurface study of the area, after which Gulf took a block of about 680 acres. There has been little geophysical activity in this immediate area.

⁵ Exact figures not available since production of all wells on lease are run to same tank battery.

WASHINGTON POOL

An area which has held the attention of the industry for a year and a half was brought into production in May when the Carter Oil Company completed Cottingham No. 1, center of SE. $\frac{1}{4}$, SW. $\frac{1}{4}$ of Sec. 4, T. 7 N., R. 3 W., just about a year after spudding. This was the first of six wells which the Carter has drilled in northern McClain County in its campaign to extend production on the west flank of the "granite ridge." As of the first of the year this campaign had yielded two oil wells and two dry holes, with two wells drilling.

The Cottingham was drilled to 11,209 feet, which is 578 feet below the top of the "Wilcox" sand. Showings in the Hunton limestone and Ordovician sands were cored, the Second "Wilcox" being cored almost continuously from 10,630 to 10,692½ feet. A lower sand was cored from 11,155 to 11,160½ feet. At the total depth, 11,209 feet, the hole was plugged back to 10,863 feet and the 5½-inch casing cemented at 10,769 feet. A series of perforations and squeeze-offs was culminated by 155 shots between 10,625 and 10,645 feet, after which the well flowed 207 barrels of 40.7° gravity oil through tubing choke which varied between 3/16 and ¼ inch. Gas gauged at 180,000 cubic feet daily accompanied the oil.

Five miles northwest of the Cottingham the Johnson Ranch No. 1, center of SW. $\frac{1}{4}$, NE. $\frac{1}{4}$ of Sec. 13, T. 8 N., R. 4 W., was drilled to 10,536 feet where it was abandoned in white sand. Numerous cores were taken in the "Wilcox" sand without encouraging showings, but 5½-inch casing was set at 9666 feet and a test made in the sand. As salt water was recovered, the hole was plugged back to 9615 feet and tests made in the Hunton, after which a lower Pennsylvanian sand at 8709 to 8724 feet was tested. The well was then abandoned.

The Lamar Ranch No. 1, NE. $\frac{1}{4}$, NE. $\frac{1}{4}$, SW. $\frac{1}{4}$ of Sec. 28, T. 8 N., R. 3 W., 2½ miles north of the Cottingham, and the Johnson No. 1, NW. $\frac{1}{4}$, SW. $\frac{1}{4}$, SE. $\frac{1}{4}$ of Sec. 30, T. 8 N., R. 2 E., 5 miles northeast of the Cottingham, were then drilled. The Lamar Ranch was abandoned as a dry hole at 10,884 feet after the sand which produced in the Cottingham yielded 6500 feet of salt water on drill-stem test. The Johnson No. 1 was completed as a producer from the Second "Wilcox" sand topped at 8190 feet, at plug-back depth of 8200 feet from total depth of 8222 feet. The 5½-inch casing was cemented at 8219 feet, and perforated between 8190 and 8200 feet, after which 2½-inch tubing was run and the well flowed 322 barrels of 40° gravity oil in 24 hours through ¼-inch choke. This is considered as the discovery well of the West Noble pool.

The McBride No. 1, center of SE. $\frac{1}{4}$, NW. $\frac{1}{4}$ of Sec. 9, T. 7 N., R. 3 W., ½ mile south of the Cottingham, and the M. T. Johnson No. 1, center of SW. $\frac{1}{4}$, NE. $\frac{1}{4}$ of Sec. 30, T. 8 N., R. 2 W., ½ mile north of the N. R. Johnson, were drilling at the close of the year.

The Carter Oil Company first worked in this area with the seismograph in 1934 and 1935, but did not do extensive work here until 1942, after which it made a lease play, extending from the SE. $\frac{1}{4}$ of T. 9 N., R. 4 W., southeast to the NW. $\frac{1}{4}$ of T. 6 N., R. 3 W., and embracing approximately 32,000 acres.

The first geophysical activity in the area appears to have been by the Gulf Oil Corporation (Gypsy Division), which did some seismograph and torsion-balance work in 1930. Since then, and before the Carter's play, seven different companies have worked the area in some detail with seismograph or gravimeter.

SOUTH MOORE POOL

The discovery in 1943 of the West Moore pool⁶ by the Mid-Continent Petroleum Corporation was soon followed by the staking of the location for its Westmeir No. 1, NE. $\frac{1}{4}$, SW. $\frac{1}{4}$, SW. $\frac{1}{4}$ of Sec. 26, T. 10 N., R. 3 W., about half way between the Moore and West Moore pools. Westmeir No. 1 was drilled to and completed in the Second "Wilcox" sand topped at 8825 feet, with the total depth at 8902 feet. The 5 $\frac{1}{2}$ -inch producing casing was set at 8899 feet and perforated with 95 shots between 8833-8865 feet, after which the well flowed 757 barrels of oil through $\frac{3}{8}$ -inch tubing choke. About 2,000,000 cubic feet of gas accompanied the oil.

The east offset, Brand No. 1, was drilled to 9219 feet in the Second "Wilcox" but was plugged back to the Bartlesville sand and completed as the discovery well in this formation. The Bartlesville was encountered between 7740-7775 feet, and was perforated with 120 shots between 7742 and 7772 feet, after which it flowed 750 barrels of 35° gravity oil through $\frac{1}{2}$ -inch tubing choke.

The Mid-Continent made a detailed seismograph survey in this area in 1942. After the discovery of the West Moore pool it returned and did additional shooting in the area where the South Moore pool was found. The company also made a gravimeter survey in this township in 1943.

EAST PAULS VALLEY

Oil in this pool was discovered in April when the Ramsey Petroleum Company completed McDowell No. 1, center of NE. $\frac{1}{4}$, SE. $\frac{1}{4}$ of Sec. 13, T. 3 N., R. 1 E., for 51 barrels of oil on the pump from a Pennsylvanian sand, 2960-2984 feet. The well was drilled to 3250 feet and passed from the Pennsylvanian directly into truncated McLish (Ordovician). It was plugged back to 3170 feet and the Pennsylvanian sand perforated. The location is $1\frac{3}{4}$ miles west of the original Ohio Oil Company's Burns No. 1, center of E. line, SW. $\frac{1}{4}$ of Sec. 17, T. 3 N., R. 2 E., which, after blowing wild for 3 months, was completed in August, 1943, for 129 million cubic feet of gas from a Pennsylvanian sand topped at 2881 feet. In May the Ohio completed McKinney No. 1, SW. $\frac{1}{4}$, NE. $\frac{1}{4}$, SE. $\frac{1}{4}$ of Sec. 18, T. 3 N., R. 2 E., for 265 barrels of oil from the same sand topped at 2866 feet.

The Marathon Oil Company, now Ohio, made a seismograph survey in this area in 1935 and 1936. The Ohio reshot the area in the spring of 1944, after discovery of gas in the Burns well. The Ohio was one of eight different companies to work the area in some detail with seismograph prior to the Ohio play. Surveys

⁶ J. L. Borden, "Developments in Oklahoma in 1943," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 28, No. 6 (June, 1944), p. 782.

had also been made with magnetometer, gravimeter, torsion balance, and electrical resistivity prior to the play.

HOOVER-NORTHWEST

This pool was discovered by Helmerich & Payne in May when Freeman No. 1, center of SE. $\frac{1}{4}$, SE. $\frac{1}{4}$ of Sec. 14, T. 1 N., R. 1 W., was completed as a flowing well with an initial production of 120 barrels of 39.8° gravity oil through 1/16-inch tubing choke. Gas estimated at 1 million cubic feet accompanied the oil. Production is from a Pennsylvanian sand between 1107 and 1120 feet, total depth.

The original play was made by the Marathon Oil Company, now the Ohio Oil Company, which shot the area with seismograph in 1936 and took acreage. In 1941 the Ohio drilled Freeman No. 1, SE. $\frac{1}{4}$ SE. $\frac{1}{4}$, SE. $\frac{1}{4}$ of Sec. 14, T. 1 N., R. 1 W., Helmerich & Payne being the drilling contractors. The well was drilled to 4365 feet, where it was abandoned still in Pennsylvanian conglomerate. Two upper formations which showed gas when drilled were tested before the well was abandoned.

In 1943 the Ohio drilled a second well, Simpson Kelly No. 1, NW. $\frac{1}{4}$, NE. $\frac{1}{4}$, SW. $\frac{1}{4}$ of Sec. 14, T. 1 N., R. 1 W., which was drilled to 4993 feet, again without getting out of the Pennsylvanian. Oil-stained sand was cored and 25,000 cubic feet of gas recovered in drill-stem test while drilling the upper section. The Ohio then farmed the play out to Helmerich & Payne who moved 330 feet northwest of the original dry hole and completed the discovery well. Since then Helmerich & Payne have cleaned out the original dry hole, plugged it back from 4365 feet to 1247 feet, ripped the casing from 1098 to 1100 feet, and completed the well for 168 barrels of oil through 3/16-inch tubing choke.

Two additional Pennsylvanian producing sands have been developed. In August, W. A. Delaney completed Russell No. 1, SW. $\frac{1}{4}$, SE. $\frac{1}{4}$, SW. $\frac{1}{4}$ of Sec. 13, T. 1 N., R. 1 W., at 1399 feet, plugged back from 1474 feet, total depth, where it flowed 5 barrels of oil daily after acidizing a sandy limestone, 1335 to 1360 feet. Almost at the same time, W. A. Delaney's Russell No. 2, NW. $\frac{1}{4}$, SE. $\frac{1}{4}$, SW. $\frac{1}{4}$ of Sec. 13, T. 1 N., R. 1 W., found oil in a sand from 1962 to 1977 feet, and was completed for 10 barrels of 55° gravity oil on the pump at 1990 feet, total depth.

The pool consists of 14 producing wells, 6 in the 1100-1200-foot zone, with the largest initial production 168 barrels, 6 in the 1350-1400-foot zone with initial production up to 375 barrels, 2 in the 1900-2000-foot zone with 75 barrels the largest initial production. There are 7 dry holes, 3 drilling wells, and 3 locations.

EXPLORATORY METHODS

Exploratory work increased⁷ in amount but not in types during 1944. Geophysical activity was represented by seismograph and gravimeter, and increased

⁷ Part of the increase shown may be due to an effort to get more complete reports from all companies operating in the state.

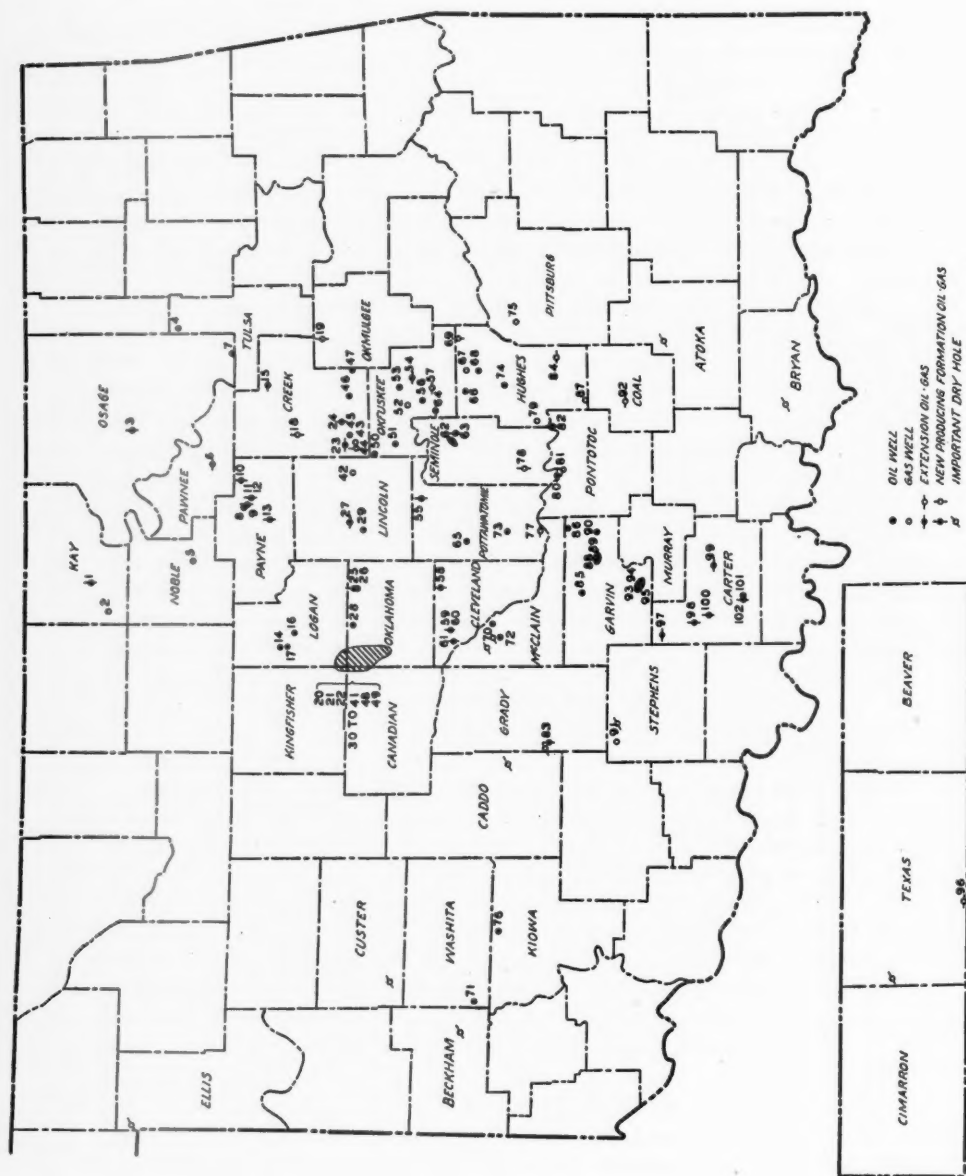


FIG. 2.—Map showing new pools, extensions, new producing formations, and important dry holes drilled in 1944.

170 crew months, or 47.1 per cent over 1943. Seismograph work increased 56 per cent, and gravimeter work increased 8.3 per cent. There were 47 seismograph crews operating in the state in February and March, but only 31 as the year closed. At one time there were 9 crews operating for one company. The peak of gravimeter work was in April with 8 crews operating, the low was in July with 2 crews. Core drilling was employed extensively by only 2 companies, but increased 127 per cent in number of holes drilled. The number of stratigraphic holes drilled

TABLE IV
IMPORTANT DRY HOLES DRILLED DURING 1944

Location	County	Company	Farm	Total Depth	Deepest Formation Tested	Remarks
27-24N-26W	Ellis	Gulf	Polin	9305	Miss.	Seismograph play
18-12N-10W	Custer	Fox & Fox	Dirickson	7150	Penn.	Another Anadarko basin test
25-9N-22W	Beckham	Northern Ordinance	Crawford	8221	Woodford	On north flank Wichita-Amarillo Mt. trend, east of Sayre
28-8N-3W	McClain	Carter	Lamar Ranch	10,884	"Wilcox"	Ordovician test on west flank granite ridge
13-8N-4W	McClain	Carter	Johnson Ranch	10,536	"Wilcox"	Ordovician test on west flank granite ridge
21-7N-9W	Caddo	Stephens	Lawrence	9663	Penn.	Gulf seismograph play in Anadarko basin farmed out. Cored Medrano sand
8-5N-8W	Grady	Skelly	Goodwin	10,404	Penn.	Between Cement oil field and Chickasha gas field. Had good showing in Medrano sand
28-4N-10ECM	Texas	Gulf	McCoy	5888	Arbuckle	Another Panhandle deep test based on seismograph
16-2N-7W	Stephens	Gulf	Springs	10,006	Penn.	Seismograph play in Duncan area. Showing oil in 9300 ft. sand
19-1S-12E	Atoka	Northern Ordinance	Fulton	7022	Atoka	Carter farm-out along Choctaw fault. Spudded in Atoka
6-7S-9E	Bryan	Magnolia	School land	5308	Springer	70° dips in bottom-hole core

decreased. The 192 per cent increase reported in surface mapping exceeds all other types of exploratory work on a percentage increase basis. (No effort is made to report on subsurface work.)

Table V gives a comparative summary of all exploratory work reported for 1944 and 1943.

TABLE V
SUMMARY OF EXPLORATORY WORK, 1944-1943

	Amount Work		Number Companies	
	1944	1943	1944	1943
Seismograph	459½	294½ crew months	30	22
Gravimeter	72	66½ crew months	10	9
Surface detail	27½	9½ crew months	7	1
Core drill	211	93 holes	4	4
Stratigraphic drill	9	16 holes	5	4

BIBLIOGRAPHY

Important additions to the literature of Oklahoma geology pertaining to oil are listed.

- H. A. IRELAND AND A. P. WISHART, "Correlation and Subdivision of Subsurface Lower Ordovician and Upper Cambrian Formations in Northeastern Oklahoma," *U. S. Geol. Survey Prelim. Chart 5*, Oil and Gas Inves. Ser. (November, 1944).
- STUART L. SCHOFF AND J. WILLIS STOVALL, "Geology and Ground Water Resources of Cimarron County, Oklahoma," *Oklahoma Geol. Survey Bull. 64* (1943).

The West Edmond field has been described in four published articles.

- E. G. DAHLGREN, "Significant Features of West Edmond Field," *World Petroleum*, Vol. 15, No. 9 (August, 1944), p. 40.
- CHARLES J. DEEGAN, "West Edmond Field Presents Paradox," *Oil and Gas Jour.*, Vol. 43, No. 18 (September 9, 1944), p. 44.
- E. G. DAHLGREN, "West Edmond Opens Big Area for Hunton," *Oil Weekly*, Vol. 115, No. 3 (September 18, 1944), p. 31.
- DEAN MCGEE, "The West Edmond Oil Field," presented at the Fall Quarterly Meeting of the Interstate Oil Compact Commission, October 6, 1944, and published in the *Quar. Bull. Interstate Oil Compact*, Vol. III, No. 3 (October 1944); also published in *Rineharts Oil Report*, Tulsa Edition (October 18, 1944).

DEVELOPMENTS IN TEXAS PANHANDLE IN 1944¹

C. RICHARD WAGNER²

Amarillo, Texas

ABSTRACT

The Texas Panhandle produced 33,402,261 barrels of oil and 747,361,875,000 cubic feet of sweet and sour gas in 1944. This represents an increase in production for 1944 of 27,768 barrels of oil and 54,855,017,000 cubic feet of gas over 1943 production.

In all, 338 wells were drilled during the year of which 12 wells were wildcats or semi-wildcats. This is an increase of 66 per cent in operations for 1944 over 1943. There were no new discoveries or producing formations for the year. Gas production was extended further westward in western Moore County.

Exploration activities of all types remained low for the entire area.

INTRODUCTION

The Panhandle district includes the northernmost 24 counties in Texas. At present there is oil or gas production in 10 counties of the area and most of the activity is confined to these known producing counties.

DEVELOPMENTS

The Texas Panhandle produced 33,402,261 barrels of oil and 747,361,875,000 cubic feet of sweet and sour gas during 1944. This represents an increase in production for the year of 27,768 barrels of oil and 54,855,017,000 cubic feet of gas above 1943 production. As of December 31, 1944, the Texas Panhandle had produced approximately 12,200 billion cubic feet of sweet and sour gas and 500 million barrels of oil and there were 5890 producing oil wells, 1760 producing gas wells, or a total of 7650 producing wells in the area. There have been 9818 wells drilled in the area.

Drilling operations for the year increased approximately 66 per cent over 1943. There were 338 wells drilled during 1944. Of these wells, 63 were gas wells, 244 were oil wells, and there were 31 dry holes. Exploratory drilling increased from 5 to 12 wells resulting in one extension for the gas area. Though there was more activity throughout the area during 1944 than there had been for several years, the total number of operations for the Panhandle was only about half the number recorded in pre-war years.

TABLE I
COMPARATIVE BREAK-DOWN OF WELLS DRILLED IN 1943 AND 1944

	<i>Total</i>	<i>Oil</i>	<i>Gas</i>	<i>Expl.</i>	<i>Ext.</i>	<i>Dry</i>
1944	338	244	63	12	1	31
1943	177	124	30	5	0	23

Drilling in the gas areas increased during the year and for the first time in several years completions were recorded in Hansford, Sherman, and Hartley counties. Commencing late in the summer, a large number of locations were

¹ Manuscript received, April 10, 1945.

² Pure Oil Company.

made in the gas areas and by late fall drilling operations in the Panhandle were at their peak. The major part of these operations is not reflected in the completions for the year.

EXTENSIONS

One extension in the gas area of western Moore County was recorded during 1944. With the completion of Love No. 1, 2310 feet S. and W. of the NE. corner of Sec. 200, Block 44, H. & T. C. RR. Co. Survey, and Vinson No. 1, 2671 feet S. and 2636 feet W. of the NE. corner of Sec. 92, Block 44, H. & T. C. RR. Co. Survey, the Phillips Petroleum Company extended gas production westward 5 miles in Moore County. The Phillips Petroleum Company commenced drilling Love No. 1 and Vinson No. 1 in 1943. Both holes were completed as sour-gas wells in March, 1944.

The Vinson No. 1 topped the Permian brown dolomite (top is the approximate equivalent of the Herington of Kansas) at 3475 feet and was drilled to 3765 feet, encountering water at 3762-3765 feet. The well was then plugged back to 3609 feet, acidized with 4500 gallons of acid and completed as a sour-gas well with an initial potential of 4,400,000 cubic feet per day.

The Love No. 1 was drilled to 3749 feet, topping the brown dolomite at 3320 feet, and encountered water at 3744-3749 feet. The well was plugged back to 3565 feet, acidized with 8250 gallons of acid and on initial potential tested 14,000,000 cubic feet of sour gas per day. Both wells are producing from the brown dolomite section which is the normal producing formation for the area. As a result of these wells, an extensive drilling campaign was begun late in the year in western Moore County.

IMPORTANT DRY HOLES

In July, the Pure Oil Company completed Sneed Heirs No. 1, 660 feet S. and W. of the NE. corner of Sec. 13, Block 18, Capitol Syndicate Subdivision, Dallam County, as a dry hole at the total depth of 6779 feet, in pre-Cambrian rocks which were encountered at 6768 feet. The Sneed Heirs No. 1 was located several miles west of a dry hole (James Ranch No. 1), bottomed in rocks of Pennsylvanian age at the total depth of 4295 feet, which was drilled by the Marland Oil Company in 1928, and northwest of the Stratford dome in Sherman County on which the Indian Territory Illuminating Oil Company discovered gas in 1938 in Permian rocks. On top of the pre-Cambrian the Sneed Heirs No. 1 was 1270 feet lower structurally than the Indian Territory's Bryan No. 1-A, Sec. 369, Block 1-T, T. & N. O. RR. Co. Survey, which was drilled near the crest of the Stratford dome. A reasonably well developed sand of Simpson age was found—the farthest north and west that this sand had been reported in the area. Location of the Sneed Heirs No. 1 was made after extensive core drilling in the area.

One of the most interesting tests of the year for this area was the Phillips Petroleum Company's Whittenburg No. 73, 1510 feet N. and 1350 feet E. of the SW. corner of Sec. 63, Block 46, H. & T. C. RR. Co. Survey, Hutchinson County.

This well was located on the north flank of the Amarillo ridge and is 5 miles east of the same company's Elva No. 12, drilled in 1927 and abandoned at the total depth of 5333 feet in rocks which have been tentatively identified as being Mississippian in age. The Whittenburg No. 73 was bottomed at 7682 feet after penetrating 952 feet of Arbuckle sediments. This well penetrated 300 feet of cherty limestones which have been tentatively identified as being Mississippian in age, topped the Simpson dolomites at 6500 feet, and then encountered the Arbuckle at 6730 feet. The Whittenburg No. 73 passed from Pennsylvanian into Mississippian rocks which were older in age than those encountered in the Elva No. 12 below the unconformity, and was lower structurally on the flanks of the Amarillo ridge. This well drilled the thickest section of Arbuckle strata which has been recorded in the Panhandle. Location for the well was made on subsurface information.

Late in the year the Shamrock Oil and Gas Corporation and the Phillips Petroleum Company abandoned drilling at Taylor No. 2,³ in the center Sec. 11, Block 1, J. Poitevent Survey, Moore County, at the total depth of 6706 feet after penetrating 380 feet of Arbuckle strata. The Taylor No. 2 encountered rocks of Mississippian age at 5530 feet, which was 465 feet higher structurally than the Phillips Petroleum Company's Wilson No. 2, Sec. 157, Block 3-T, T. & N. O. RR. Co. Survey, Moore County, located 11 miles northeast, encountered rocks of the same age. The Taylor No. 2 drilled approximately the same section of pre-Pennsylvanian rocks as encountered in the Wilson No. 2, though the stratigraphic section was not as well developed in the Taylor No. 2. Of particular interest was the absence in the Taylor No. 2 of the thick Simpson sand section present in the Wilson No. 2. Location for the test was the result of subsurface work.

Of interest and importance is the indication toward thinking of deeper oil possibilities along the Amarillo uplift. In the past the possibilities for deeper production, especially from older Paleozoic rocks, have not received much consideration. The Taylor No. 2 and Whittenburg No. 73 indicate that operators are giving these deeper oil possibilities some of the consideration which they warrant.

TABLE II
SUMMARY OF EXPLORATION WORK FOR 1944*

Type	Number of Companies	Crew—Months in Operation
Magnetometer	2	6
Gravimeter	5	10
Seismograph	3	4
Core drill	2	14

* Summary is only approximate as all companies do not report activities in this area.

³ F. W. Fosshage, "Recent Deep Test in Moore County, Texas," *Bull. Amer. Assoc. Petro. Geol.* (February, 1945), pp. 227-29.

EXPLORATION

Exploration work for the area was more active than in 1943, but no part of the area received what could be called an active exploration campaign. Most companies confined themselves to geophysical work of reconnaissance nature and gravity methods seemed to be preferred over other types. Toward the close of the year some companies were moving in seismograph crews and there were indications that in 1945 there would be more activity than in several years. Operations reached a peak late in the fall of the year.

DEVELOPMENTS IN WEST TEXAS AND SOUTHEASTERN NEW MEXICO IN 1944¹

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ABSTRACT

In all, 1,672 wells were drilled in West Texas in 1944, which is the greatest number drilled in any year since 1941. There were 203 exploratory wells completed in 1944, of which 42 were producers, representing a discovery success of 20.69 per cent. These 42 producers resulted in the discovery of 14 new fields officially designated as such by the Oil and Gas Division of the Texas Railroad Commission, and of at least three others assigned by the Commission to existing producing fields. Two new producing zones, one in the Wolfcamp and one in the Devonian, were established, and new pay zones of major importance were discovered in 3 existing fields, including the development of production in the upper San Andres and McKnight zones in the Sand Hills field, Crane County, and the discovery of Ellenburger oil in the Todd field, Crockett County. Major extensions were made to 12 existing fields.

Of the 203 wildcats drilled during the year in West Texas, the 83 of outstanding importance included 9 drilled to the pre-Cambrian and 20 which tested the Ellenburger.

Pipe-line runs from West Texas were 160,780,000 barrels, or 62,710,000 more than in 1943, while in New Mexico total runs of 29,030,000 barrels exceeded those of 1943 by 560,000 barrels.

In southeastern New Mexico 405 wells were drilled in 1944, of which 60 were exploratory, and of these, 13 or 21.6 per cent, were producers. Of 9 new producing areas only 4 are of major importance, and include the development for the first time of pre-San Andres production in southeastern New Mexico. New zones discovered include Yezo production in the Drinkard field, and Wolfcamp production in the Skaggs-Deep field, of Lea County, and the establishment of Ellenburger production in the Dublin field, of southeastern Lea County. Probably the most important discovery from the viewpoint of reserves was the West Lovington field, in Lea County.

Geophysical activity increased slightly during the year in both West Texas and southeastern New Mexico. In West Texas the number of crews of all types increased from 43 in January, to 46 in December. In southeastern New Mexico 7 crews were working in January, and 13 in December. Seismographs and gravimeters predominated in both areas throughout the year. Twelve geological and development publications appeared during 1944, in one of which a member of the Salado formation was described, and the name "Vaca Triste" proposed for it.

INTRODUCTION

The West Texas-Southeastern New Mexico district, as defined by Winter and Donnelly,⁴ embraces an area of about 100,000 square miles in 46 counties in Texas and 6 in New Mexico. The north boundary is the parallel forming the north lines of Bailey, Lamb, Hale, Floyd, and Motley counties; the east boundary extends from northwest Motley County, south to Real County. The Rio Grande bounds the district on the south and southwest. The New Mexico counties of Lea, Eddy, Chaves, Roosevelt, DeBaca, and Curry are included in the district.

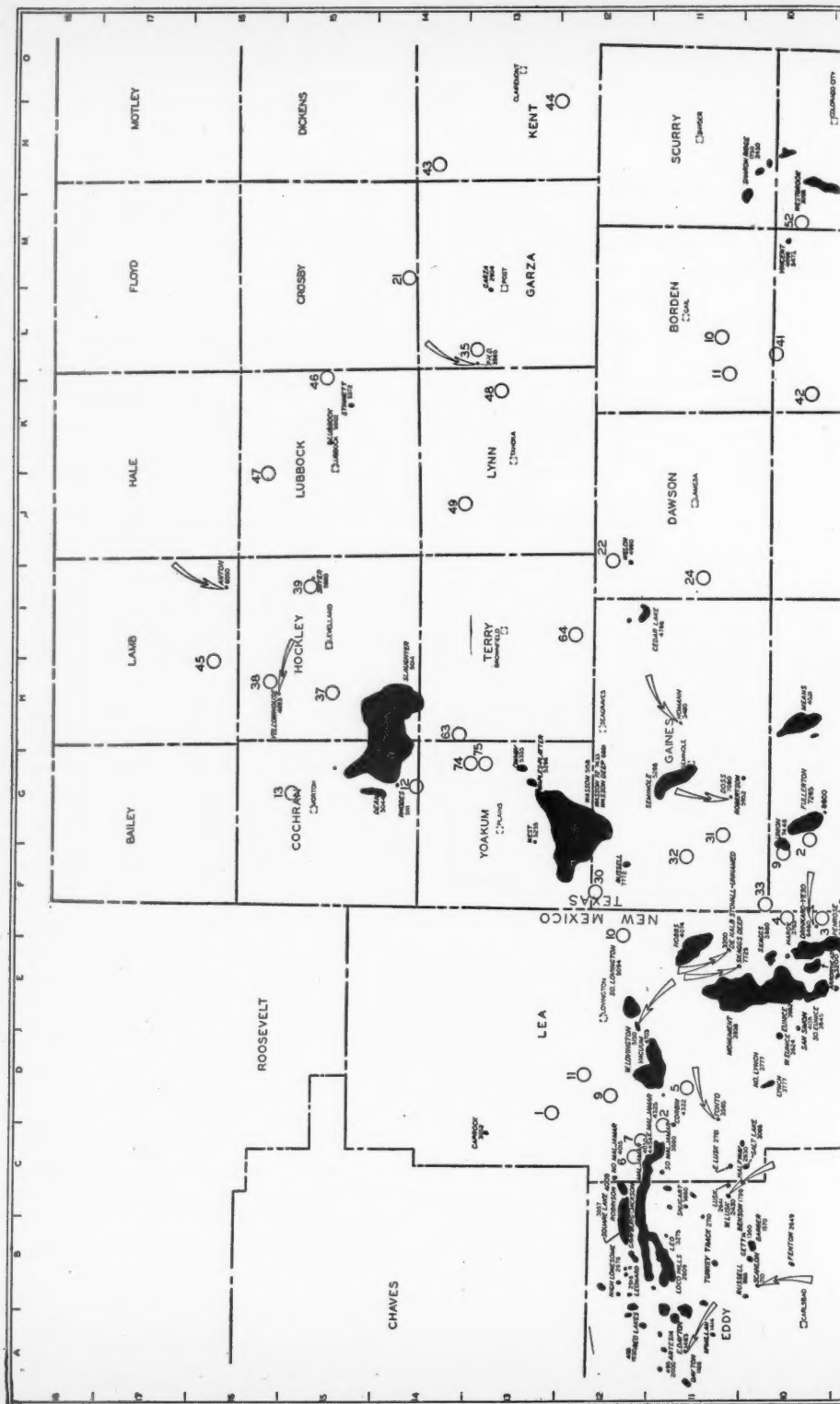
¹ Manuscript received, April 10, 1945.

² Geologist, Union Oil Company of California.

³ Geologist, Stanolind Oil and Gas Company.

The writers wish to acknowledge their indebtedness to their friends and associates, especially E. Russell Lloyd and R. I. Dickey, for contributing information and helpful criticism during the preparation of this paper and to the managements of the Union Oil Company of California and the Stanolind Oil and Gas Company for permission to write it. They wish also to thank the North Basin Pools Engineering Committee and the Goldsmith Pool Engineering Committee for the use of their base map.

⁴ Niles B. Winter and Alden S. Donnelly, "Developments in West Texas and Southeastern New Mexico," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 28, No. 6 (June, 1944), pp. 806-33.



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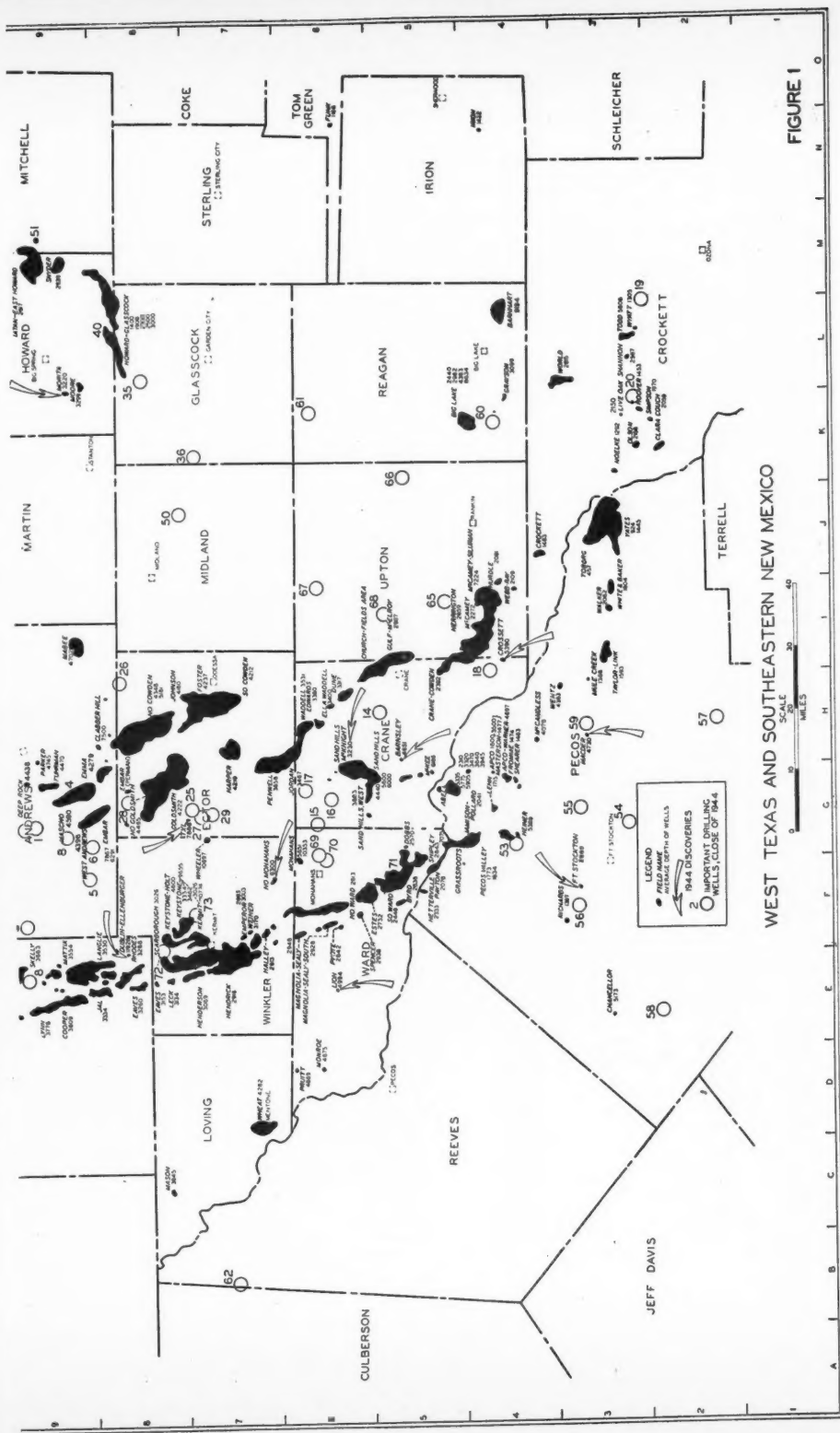


TABLE I
PRODUCING FIELDS, WEST TEXAS*
(December 31, 1944)

Map Co-Ord.	Field Name	County	Producing Formation	Age
G-5	Abell	Pecos	Simpson and Ellenburger	Ordovician
G-5	Abell, Permian	Pecos	San Andres, Clear Fork and Wichita	Permian
**I-16	Anton	Lamb	Clear Fork	"
G-4	Apco, 1,600	Pecos	Queen	"
G-4	Apco-Warner	Pecos	Ellenburger	Ordovician
L-4	Barnhart	Reagan	Ellenburger	"
**G-5	Barnsley	Crane	Clear Fork	Permian
K-4	Big Lake	Reagan	Queen, San Andres, Clear Fork, and Ellenburger	Permian, Ordovician
F-5	Byrd	Ward	Yates	Permian
I-12	Cedar Lake	Gaines	San Andres	"
E-3	Chancellor	Pecos	Delaware Mountain	"
H-8	Clabberhill	Andrews	Holt, San Andres	"
K-2	Clara Couch	Crockett	Grayburg and San Andres	"
I-5	Cowden, Crane	Crane	Grayburg	"
H-8	Cowden, North	Ector	Grayburg and San Andres	"
H-8	Cowden, North Deep	Ector	Holt, San Andres	"
H-7	Cowden, South	Ector	Grayburg	"
J-4	Crockett	Crockett	Grayburg	"
**I-4	Crossett	Crane	Devonian	Devonian
G-15	Dean	Cochran	San Andres	Permian
G-9	Deep Rock	Andrews	San Andres	"
G-5	Dobbs	Ward	Queen	"
**G-11	Doss	Gaines	Clear Fork	"
H-6	Dunes	Crane	Grayburg	"
E-8	Eaves	Winkler	Yates and Seven Rivers	"
H-6	Edwards	Crane	Grayburg	"
G-8, 9	Embar Ellenburger	Andrews	Ellenburger	Ordovician
G-8	Embar Permian	Andrews	Tubb, Clear Fork	Permian
G, H-8	Emma	Andrews	San Andres	"
F-7	Emperor	Winkler	Yates and Seven Rivers	"
F-7	Emperor (Deep)	Winkler	Seven Rivers	"
F-5, 6	Estes	Ward	Yates and Seven Rivers	"
**F-3	Fort Stockton	Pecos	Yates	"
H-7	Foster	Ector	Grayburg and San Andres	"
G-4	Fromme	Pecos	Queen	"
G-9	Fuhrman	Andrews	San Andres	"
G-10	Fullerton	Andrews	Yates, Clear Fork and Devonian	Devonian
N-6	Funk	Tom Green	San Andres	Permian
L-13	Garza	Garza	San Andres	"
G-8	Goldsmith	Ector	Grayburg and San Andres	"
G-8	Goldsmith, North	Ector	San Andres	"
K-4	Grayson	Reagan	San Andres	"
F-7	Halley	Winkler	Yates and Seven Rivers	"
F-7	Halley, Extension	Winkler	Yates and Seven Rivers	"
H-7	Harper	Ector	San Andres	"
G-4	Heiner	Pecos	Ellenburger	Ordovician
E-7	Henderson	Winkler	Yates and Seven Rivers	Permian
E, F-7, 8	Hendrick	Winkler	Yates and Seven Rivers	"
I-4	Harrington	Upton	Grayburg	"
**H-11	Homann	Gaines	Yates	"
K-3	Hoover	Crockett	Queen	"

TABLE I—Continued

Map Co-Ord.	Field Name	County	Producing Formation	Age
L,M-8	Howard-Glasscock	Howard and Glasscock	Yates, Seven Rivers Grayburg, San Andres, and Clear Fork	Permian " "
I-4	Hurdle	Upton	Grayburg	"
M-9	Iatan-East Howard	Howard	Clear Fork	"
M-9	Iatan, North	Howard	Clear Fork	"
N-4	Irion	Irion	San Angelo	"
G-5	Jamison-Pollard	Pecos	Seven Rivers	"
H-8	Johnson	Ector	Grayburg	"
H-6	Jordan	Ector	Grayburg and San Andres	"
F-7,8	Kermit	Winkler	Yates and Seven Rivers	"
F-7,8	Kermit Ellenburger	Winkler	Ellenburger	Ordovician
F-7,8	Keystone-Colby	Winkler	Queen	Permian
F-7,8	Keystone Lime	Winkler	Grayburg and San Andres	"
F-7,8	Keystone Ellenburger	Winkler	Ellenburger	Ordovician
F-7,8	Keystone Holt	Winkler	Holt, San Andres	Permian
**E-6	Lion	Ward	Delaware Mountain	"
K-3	Live Oak	Crockett	San Andres	"
E-8	Leck	Winkler	Yates and Seven Rivers	"
G-4	Lehn	Pecos	Queen	"
K-15	Lubbock	Lubbock	Clear Fork	"
**H-3	MacDer	Pecos	Wolfcamp	"
I-9	Mabee	Andrews	Grayburg	"
F-6	Magnolia Sealy	Ward	Yates and Seven Rivers	"
F-6	Magnolia Sealy, South	Ward	Yates and Seven Rivers	"
G-9	Mascho	Andrews	Grayburg and San Andres	"
G-8	Mason	Loving	Delaware Mountain	"
G-4	Masterson	Pecos	Queen	"
G-4	Masterson 3,500	Pecos	Tubb, Clear Fork	"
H-4	McCandless	Pecos	Ellenburger	Ordovician
I-4	McCamey	Upton	Grayburg and San Andres	Permian
I-5	McElroy	Upton, Crane	Grayburg	"
G-5	McKee	Crane	Simpson	Ordovician
H-10	Means	Andrews	San Andres	Permian
G-6	Monahans	Ward	Ellenburger	Ordovician
G-6	Monahans Permian	Ward	Tubb, Clear Fork	Permian
**F-7	Monahans, North	Ward	Tubb, Clear Fork	"
D-6	Monroe	Ward	Delaware Mountain	"
L-9	Moore	Howard	Grayburg	"
**L-9	Morita	Howard	San Andres	"
H-3	Mule Creek	Pecos	Queen	"
F-5	Netterville	Pecos	Yates	"
K-3	Noelke	Crockett	Seven Rivers	"
K-3	Olson	Crockett	Grayburg	"
G-13	Owaby	Yoakum	San Andres	"
P-3	Page	Schleicher	Strawn	Pennsylvanian
H-9	Parker	Andrews	San Andres	Permian
F-5	Payton	Ward	Yates	"
G-4	Pecos Valley (HG)	Pecos	Yates	"
G-4	Pecos Valley (LG)	Pecos	Yates	"
H-7	Penwell	Ector	San Andres	"
**L-13	PHD	Garza	San Andres	"
D-6	Pruitt	Ward	Delaware Mountain	"
F-6	Pyote	Ward	Yates	"
G-14	Rhodes	Cochran	San Andres	"
F-3	Richards	Pecos	Dewey Lake	"

TABLE I—Continued

Map Co-Ord.	Field Name	County	Producing Formation	Age
G-10	Robertson	Gaines	Holt, San Andres	Permian
F-12	Russell	Gaines	Lower Clear Fork	"
**G-6	Sand Hills McKnight	Crane	San Andres	"
G-5,6	Ordovician Sand Hills	Crane	Simpson and Ellenburger	Ordovician
G-5,6	Sand Hills Permian	Crane	Tubb, Clear Fork	Permian
G-6	Sand Hills, West	Crane	Holt, San Andres	"
E-8	Scarborough	Winkler	Yates	"
G-11	Seminole	Gaines	San Andres	"
L-3	Shannon	Crockett	Grayburg	"
M-10	Sharon Ridge 2,400	Scurry	San Angelo and Clear Fork	"
M-10	Sharon Ridge 1,700	Scurry and Mitchell	San Andres	"
G-4	Shearer	Pecos	Seven Rivers and Queen	"
G-5	Shipley	Ward	Queen	"
G-5	Shipley Silurian	Ward	Silurian	Silurian
K-2	Simpson	Crockett	Grayburg	Permian
H-14	Slaughter	Cochran and Hockley	San Andres	"
I-15	Smyer	Hockley	Clear Fork	"
M-9	Snyder	Howard	San Angelo and Clear Fork	"
F-6	Spencer	Ward	Yates	"
K-15	Stinnett	Lubbock	Clear Fork	"
I-3	Taylor-Link	Pecos	Yates, Queen and San Andres	"
J-3	Toborg	Pecos	Toborg	Cretaceous
L-3	Todd Deep	Crockett	Crinoidal (Strawn)	Pennsylvanian
I-4	McCamey Silurian	Upton	Silurian	Silurian
F-10	Union	Andrews	Lower Clear Fork	Permian
M-13	Vincent	Howard	Clear Fork	"
H-6	Waddell	Crane	Grayburg	"
H-6	Waddell, Ella	Crane	Grayburg	"
I-3	Walker	Pecos	Queen	"
G-13	Waples Platter	Yoakum	San Andres	"
F-6	Ward, North	Ward	Yates	"
F-5	Ward, South	Ward	Yates, Seven Rivers, and Queen	"
F, G-12, I-3	Wasson	Yoakum	San Andres	"
G-12	Wasson Deep 6,800	Yoakum	Lower Clear Fork	"
G-12	Wasson 72	Yoakum	Clear Fork	"
I-4	Webb Ray	Upton	Grayburg	"
F-7	Weiner	Winkler	Queen	"
J-12	Welch	Dawson	San Andres	"
H-3	Wentz	Pecos	Ellenburger	Ordovician
F-13	West	Yoakum	San Andres	Permian
G-9	West Andrews	Andrews	Grayburg and San Andres	"
N-10	Westbrook	Mitchell	Clear Fork	"
D-7	Wheat	Loving	Delaware Mountain	"
G-7	Wheeler Ellenburger	Winkler	Ellenburger	Ordovician
I-3	White and Baker	Pecos	Queen	Permian
I-3	White and Baker-Lime	Pecos	Grayburg	"
L-3	World	Crockett	Grayburg	"
L-3	Wyatt	Crockett	San Andres	"
J-3	Yates	Pecos	San Andres	"
J-3	Yates-Smith Sand	Pecos	Grayburg	"
**H-16	Yellowhouse	Hockley	San Andres	"

* Fields listed by Oil and Gas Division of the Texas Railroad Commission, December, 1944.

** 1944 discoveries.

TABLE II
FIELDS OF SOUTHEASTERN NEW MEXICO
(December 31, 1944)

Map Co-Ord.	Field Name	County	Producing Formation	Age
E-10	Anderson	Eddy	Grayburg	Permian
A-10	Arrowhead	Lea	Grayburg	"
A-11	Artesia	Eddy	Grayburg	"
B-10	Barber	Eddy	Yates	"
B-10	Benson	Eddy	Seven Rivers	"
C-13	Caprock	Lea	Queen (?)	"
	Comanche	Chaves	San Andres	"
E-9	Cooper	Lea	Seven Rivers	"
C-11	Corbin	Lea	Queen	"
A-11	Dayton	Eddy	San Andres	"
*E-11	DeKalb Stovall	Lea	Yates	"
*F-10	Drinkard-Yeso	Lea	Yeso	"
*E-8	Dublin-Ellenburger	Lea	Ellenburger	Ordovician
*A-11	East Dayton	Eddy	Grayburg	Permian
C-11	East Lusk	Lea	Seven Rivers	"
C-11	East Maljamar	Lea	Grayburg and San Andres	"
E-8	Eaves	Lea	Yates and Seven Rivers	"
E-10	Eunice	Lea	Grayburg	"
B-10	Fenton	Eddy	Delaware Mountain	"
B-10	Getty	Eddy	Yates	"
B-12	Grayburg-Jackson	Eddy	Grayburg and San Andres	"
C-10	Halfway	Lea	Yates	"
E-10	Hardy	Lea	Grayburg	"
B-12	High Lonesome	Eddy	Grayburg	"
E-11	Hobbs	Lea	San Andres	"
E-8	Jal	Lea	Seven Rivers	"
E-8	Langlie	Lea	Seven Rivers	"
B-11	Leo	Eddy	Grayburg	"
B-12	Leonard	Eddy	Grayburg and San Andres	"
B-11	Loco Hills	Eddy	Grayburg	"
D-10	Lynch	Lea	Yates and Seven Rivers	"
E-9	Lynn	Lea	Seven Rivers	"
C-12	Maljamar	Lea	Yates, Queen, Grayburg and San Andres	"
E-9	Mattix	Lea	Yates and Seven Rivers	"
A-11	McMillan	Eddy	Queen	"
D-11	Monument	Lea	Grayburg and San Andres	"
D-10	North Lynch	Lea	Yates and Seven Rivers	"
C-12	North Maljamar	Lea	Grayburg	"
E-10	Penrose	Lea	Grayburg	"
A-12	Red Lakes	Eddy	Yates, Seven Rivers, Queen, Grayburg and San Andres	"
E-11	Rhodes	Lea	Yates and Seven Rivers	"
C-12	Robinson	Eddy	Grayburg	"
B-12	Russell	Eddy	Yates	"
C-10	Salt Lake	Lea	Yates and Seven Rivers	"
D-10	San Simon	Lea	Seven Rivers	"
*B-10	Scanlon	Eddy	Tansill	"
C-11	Shugart	Eddy	Yates and Queen	"
E-10	Skaggs	Lea	Grayburg	"
*E-11	Skaggs-Deep	Lea	Abo	"
E-9	Skelly	Lea	Grayburg	"
E-10	South Eunice	Lea	Seven Rivers	"
E-12	South Lovington	Lea	San Andres	"
C-11	South Maljamar	Lea	Yates	"
V-12	Square Lake	Eddy	Grayburg	"

TABLE II—Continued

<i>Map Co-Ord.</i>	<i>Field Name</i>	<i>County</i>	<i>Producing Formation</i>	<i>Age</i>
*C-11	Tonto	Lea	Seven Rivers	Permian
B-11	Turkey Track	Eddy	Grayburg	"
D-11	Vacuum	Lea	San Andres	"
D-10	West Eunice	Lea	Seven Rivers	"
*D-12	West Lovington	Lea	San Andres	"
C-11	West Lusk (now Lusk)	Eddy	Seven Rivers	"
**D-11	West Lusk (new nomenclature)	Eddy	Yates	"

* 1944 discoveries.

** At a hearing called by the Oil Conservation Commission at Santa Fe, on January 29, 1945, a petition to redefine the boundaries of the producing fields of southeastern New Mexico was approved. The order of the Commission provided that the revised boundaries and nomenclature would become effective on March 1, 1945.

The major features are the Eastern platform, Midland basin, Central basin platform, Delaware basin, and a portion of the Edwards plateau.

DEVELOPMENT—GENERAL

More wells were drilled in West Texas during 1944 than in any year since 1941 and completions in southeastern New Mexico were more numerous than in any year since 1940. The deterring factors of slow development due to deeper drilling, and greatly increased operational costs were more than offset by the steadily increasing wartime demand for oil.

Throughout the year the emphasis was on deep exploration, and important new lower Permian and pre-Permian reserves were found. During the year the Wolfcamp, hitherto unproductive in the district, was revealed as a reservoir in both West Texas and New Mexico. The discovery, for the first time in the district, of Devonian oil in Crane County, was followed by important Devonian strikes in Andrews and Ector counties. Deep exploration in southeastern New Mexico resulted in establishing pre-San Andres production in that area for the first time, with Yeso, Abo, and Ellenburger beds as reservoirs.

The total of nearly 200 million barrels of oil produced in West Texas and southeastern New Mexico during 1944 is an increase of more than 63 million barrels over production in 1943, and represents the direct response of the industry to the greatly increased wartime demand for crude. During the year field allowances were largely adjusted to meet the demand, and gathering systems were enlarged and improved, but there were no important additions to the main trunk line capacity of the pipe lines serving the area.

In addition to the 13 new fields listed by the Oil and Gas Division of the Railroad Commission of Texas as having been discovered in 1944—the following list of wells represents additional discoveries certainly worthy, in the opinion of the writers, of new field designation.

Andrews County.—1. The Mid-Continent Petroleum Corporation's University No. 1-7, Sec. 20, Block 13, University, 1½ miles south of production in the Fuller-

ton field. This well, a failure in the Fullerton lower Clear Fork "pay," is producing from Devonian dolomite 1,500 feet deeper in the section. The field-naming committee of the West Texas Geological Society recommended "Fullerton-8500" as a name for this discovery. It was assigned to the Fullerton field by the Oil and Gas Division of the Texas Railroad Commission.

2. The Stanolind Oil and Gas Company's Midland Farms No. 1-F, Sec. 1, Block 42, T. 2 N., G&MMB&A, 7 miles northeast of production in the North Cowden field, and along no established trend. The committee recommended the

TABLE III
WEST TEXAS OPERATIONS, 1939-1944

	1939	1940	1941	1942	1943	1944
Total wells drilled	1854	1866	2325	1320	902	1672
No. of field producers	1640	1747	2190	1107	742	1395
No. of exploratory wells	114	119	135	134	111	203
No. of exploratory producers	28	47	27	33	17	42
Per cent exploratory success	25.4	25.4	20.0	24.6	15.32	20.69
Pipe-line runs (millions of barrels)	81.91	112.91	117.57	81.03	98.07	160.78

TABLE IV
SOUTHEASTERN NEW MEXICO OPERATIONS, 1939-1944

	1939	1940	1941	1942	1943	1944
Total wells drilled	648	542	371	339	260	405
No. of field producers	564	468	332	246	183	263
No. of exploratory wells	62	22	39	35	37	60
No. of exploratory producers	28	3	4	6	6	13
Per cent exploratory success	41.1	13.5	10.3	17.1	16.22	21.6
Pipe-line runs (millions of barrels)	36.97	35.48	39.34	31.93	38.47	39.03

name "Midland Farms" for this discovery. It was given a new discovery allowable, but was assigned to the North Cowden field by the Commission.

Crane County.—1. The Gulf Oil Corporation's W. N. Waddell No. 43-E, Sec. 20, Block B-26, PSL, 4 $\frac{3}{4}$ miles northeast of Ellenburger production in the Sand Hills Ordovician field. This well, an Ellenburger producer, was given a discovery allowable and assigned to the Sand Hills Ordovician field.

In addition to the foregoing outstanding discoveries, several wells more than 2 miles from production were assigned to the nearest field. They are not listed here because they may ultimately be proved to be extensions.

NEW PUBLICATIONS

Twelve geological and development publications appeared during the year. These included three papers—one by John E. Adams⁵ dealing with the Ochoa

⁵ John E. Adams, "Ochoa Series of Delaware Basin, West Texas and Southeastern New Mexico," *Bull. Amer. Asso. Petrol. Geol.*, Vol. 28, No. 11 (November, 1944), pp. 1596-1625.

series of the upper Permian in which a member of the Salado formation was described, and the name "Vaca Triste" proposed for it; the annual development paper by Winter and Donnelly;⁶ and the development paper of the American Institute of Mining and Metallurgical Engineers.⁷ There were also geological notes dealing with the Cretaceous of the Terlingua district,⁸ the Fullerton pool,⁹ Andrews County, the highest structural point in Texas,¹⁰ porosity in the Devonian of West Texas,¹¹ and the paleontology of the Delaware Mountain group.¹² Two geological maps, one of the Sierra Diablo,¹³ and one of the southern Guadalupe Mountains¹⁴ were issued by the United States Geological Survey. In addition to these, *World Petroleum* featured an article on Permian basin "pays,"¹⁵ and the West Texas Geological Society, in cooperation with the Texas State Board for Vocational Education, the Midland Independent School District, and the Extension Division, University of Texas, prepared a pamphlet intended for the instruction of operating personnel unfamiliar with the geology of the area.¹⁶

DEVELOPMENTS IN PERMIAN OF WEST TEXAS

Although the trend toward pre-Permian exploration predominated and grew stronger during the year, much exploratory drilling to Permian objectives was carried on throughout the district in 1944. The Central Basin platform was still the favored area for Permian and pre-Permian exploration, but many tests were drilled in the Northern Shelf, East Side, and Delaware basin areas. Of the 14 new fields officially credited to the district in 1944, 10 are Permian discoveries. Of these 10, however, 5 are producing from beds older than San Andres, and serve further to illustrate the trend toward deeper drilling.

⁶ Niles B. Winter and Aldon S. Donnelly, "Developments in West Texas and Southeastern New Mexico in 1943," *ibid.*, Vol. 28, No. 6 (June, 1944), pp. 806-33.

⁷ Robert S. Dewey, "Developments in West Texas Oil Fields During 1943," "Petroleum Development and Technology 1944," *Trans. A. I. M. E.*, Vol. 155, pp. 537-52.

⁸ J. Harlan Johnson, "Algal Reefs in the Cretaceous Austin Chalk of Terlingua District, Brewster County, Texas," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 28, No. 1 (January, 1944), pp. 123-26.

⁹ J. H. Moore, "Fullerton Pool, Andrews County, Texas," *ibid.*, Vol. 28, No. 10 (October, 1944), pp. 1541-42.

¹⁰ John Emery Adams, "Highest Structural Point in Texas," *ibid.*, Vol. 28, No. 4 (April, 1944), pp. 562-64.

¹¹ T. S. Jones, "Dolomite Porosity in Devonian of West Texas Permian Basin," *ibid.*, Vol. 28, No. 7 (July, 1944), pp. 1043-44.

¹² R. L. Clifton, "Ammonoids from Upper Cherry Canyon of Delaware Mountain Group in Texas," *ibid.*, Vol. 28, No. 11 (November, 1944), pp. 1644-46.

¹³ "Oil Possibilities of Sierra Diablo, Hudspeth and Brewster Counties, Texas," *U. S. Geol. Survey Prelim. Map 2*, Oil and Gas Investig. Ser. (March, 1944).

¹⁴ P. B. King and H. C. Fountain, "Geologic Map of Southern Guadalupe Mountains, Hudspeth, and Culberson Counties, Texas," *ibid.*, Map 18, Oil and Gas Investig. Ser. (November, 1944).

¹⁵ Paul F. Osborne, "Permian Basin Pays Are Many and Deep," *World Petroleum*, Vol. 15, No. 3 (March, 1944), pp. 44-49.

¹⁶ West Texas Geological Society, "Introduction to the Geology of the Permian Basin of West Texas and Southeastern New Mexico." Midland, Texas (1944).

TABLE V
DISCOVERIES IN WEST TEXAS, 1944

Map Co.-Ord.	County	Location	Pool	Operator	Form	Date	Producing Formation	Pay Interval (Feet)	Initial Production	Discovery Method
I-4	Crane	Sec 46 Blk 35 H&TC	Crossett	Texas Co.	C. W. Hobbs 1-A	8-3	Devonian limestone	5,300-5,300	F.434 oil	Subsurface and seismograph
G-5	Crane	Sec 42 Blk	Barnaley	John I. Moore	T. C. Barnsley Est. 1	2-29	Clear Fork dolomite	4,500-4,651	P.191 oil	Subsurface
G-6	Crane	32 PSL Sec 27 Blk	Sand Hills	Gulf Oil Corp.	W. N. Waddell 45	2-24	San Andres	3,144-3,230	F.11,741 oil	Subsurface
*G-8	Ector	Sec 27 PSL Sec 7 Blk	McKnight TXL	Shell and Cities Service	TXL 1	12-	Devonian chert and dolomite	7,886-8,050	F.200 oil in 2 hrs.	Subsurface
G-11	Gaines	45 Twp 1-S T&P	Doss	Humble Oil Co.	Fee 1	11-28	Clear Fork dolomite	7,030-7,080	F.210 oil	Subsurface
H-11	Gaines	A24 PSL Sec 60 Blk	Homann	Honolulu Oil Corp.	Homann 1	4-7	Yates dolomite	3,475-3,490	5,572,000 CFG	Seismograph and subsurface
L-13	Garza	Sec 11 Blk TT RR	PHD	Honolulu and Devonian	D. R. Payton 1	8-19	San Andres dolomite	3,544-3,565	P.131 oil and 30 wtr.	Subsurface and seismograph
H-16	Hockley	Lab 103-E Lge 75	Yellowhouse	Stanolind Oil & Gas	Tom Cobb 1	4-18	San Andres dolomite	4,596-4,663	P.61 oil and 19 wtr.	Seismograph and subsurface
L-9	Howard	Haskell CSL Sec 33 Blk 45 Twp 1-N	Morita	J. B. Hawley	H. H. Wilkenson 1	1-26	San Andres dolomite	3,190-3,220	P.35 oil and 7 wtr.	Subsurface
I-16	Lamb	Sec 19 T&P	Anton	Humble Oil Co.	Jackson 1	12-28	Clear Fork dolomite	5,360-6,050	P.248 oil and 98 wtr.	Seismograph and regional sub-sur- face
F-3	Pecos	Sec 3 Blk 114 G&SF	Ft. Stockton	Humble Oil Co.	O. W. Williams 1	8-22	Yates sandstone	2,840-2,880	F.22 oil	Subsurface
H-3	Pecos	Sec 4 Blk 88 A&NW	MacDer	Standard of Texas	MacDer 1-A	3-20	Holcamp sandstone	4,106-4,730	10,000,000 CFG	Regional sub-sur- face
E-6	Ward	Sec 43 Blk 18 Univ.	Lion	Lion Oil Refg. Co.	Univ. 1	10-26	Delaware Mountain	4,979-4,994	F.122 oil	Subsurface
F-7	Winkler	Sec 50 Blk A G&MM&A	North Monahans	Stanolind Oil and Gas Co.	Sealy-Smith 1	3-23	sandstone Clear Fork dolomite	6,095-6,300	F.208 oil	Seismograph and subsurface

* Official potential not taken at end of year.

TABLE VI
IMPORTANT EXPLORATORY WELLS COMPLETED, WEST TEXAS, 1944

Map Co- Ord.	Name of Well	County	Location		Depth (feet)	Oldest Formation Penetrated	Results	Date Com- pleted	Remarks
			Sec.	Blk.					
G-10	Ralph Lowe, Fee 1	Andrews	21	A-26	PSL	Wichita	D&A	1/28	Structurally low well on E. flank Fullerton Central Basin platform wildcat in extreme W. part of county. Pre-Cambrian at 10,900 ft. Top of Ellenburger, which tested dry, 12,612 ft.
F-9	Humble, W. F. Scarborough 1	Andrews	7	A-40	PSL	Pre-Cambrian	D&A	6/2	Deep test in Deep Rock area. Small showings oil and gas in Devonian. Mississippian overlain by thick section Pennsylvanian and Wolfcamp.
G-9	Humble, W. F. Carter 1	Andrews	23	A-46	PSL	Montoya	D&A	6/20	Top of Mississippian 19,160, top Devonian 19,160, top Silurian 19,160 ft.
H-8	Stanolind, Midland Farms 1-F Andrews	Andrews	1	42	Typ 2-N T&P	San Andrew	F 48 B/D, plus 11 B wtr	6/27	Midland basin wildcat. Discovery well Midland Farms area (see text).
F-8	Sinclair-Prairie, Gfsham-Hunter 1	Andrews	14	73	PSL	Pre-Cambrian	D&A	6/26	Wildcat on Central Basin platform, 7 miles W. of W. Andrews field. Penetrated 120 ft. Ellenburger above granite. Top of pre-Cambrian 11,322 ft.
G-10	Sun Oil Co. F. E. Gardner 1	Andrews	11	A-35	PSL	San Andres	F 232 B/D	5/8	1 1/2 miles W. extension Means field.
H-8	Phillips, Texas-University 1-H Andrews	Andrews	37	9	Univ.	San Andres	F 121 B/D	8/10	2 1/2 miles N. extension North Cowden field.
G-10	Mid-Continent, University 1-7	Andrews	20	13	Univ.	Devonian	F 3,744 B/D	8/23	Discovered Devonian production 1 1/2 miles S. Fullerton pool. Dry in Fullerton pay zone. Top of Ellenburger 8,420 ft.
F-10	Shell, G. N. Cox 1	Andrews	5	A-31	PSL	Pre-Cambrian	D&A	8/30	4 miles NW. Union pool. Devonian porous, but water-bearing. Base Permian 8,385, top Devonian 8,420, top Ellenburger 10,860, top pre-Cambrian 11,060 ft.
H-8	Texas Co., University 1-L	Andrews	41	9	Univ.	San Andres	F 541 B/D (87% wtr)	10/19	Hot pay discovery, 1 1/2 miles E. Emma pool (see text).
H-10	Texas Co., E. B. Jones et al. 1	Andrews	21	A-36	PSL	Clear Fork	P 154 B/D, plus 34 B wtr.	8/16	Small San Andres producer Shafter Lake area.
H-9	Texas Co., A. W. Patillo 1	Andrews	2	A-36	PSL	San Andres	P 72 B/D	7/2	Small San Andres-Grayburg producer 2 miles NE. Deep Rock area.
H-10	Signal Oil Co., M. M. Fisher 1	Andrews	25	A-35	PSL	San Andres	P 10 plus 5 B wtr.	3/20	Small San Andres producer 3 miles W. south end Means field.
G-9	Cities Service, University 1-L	Andrews	20	14	Univ.	Clear Fork	F 734,000 CFG	10/6	Wildcat in Shafter Lake area. Failure in San Andres and Clear Fork. Producing from Yates.
G-9	Champlin, University 1-B	Andrews	5	11	Univ.	Devonian	D&A	11/2	Devonian test on Central Basin platform, 3 1/2 miles W. West Andrews field. Sulphur water in Devonian. Top of Devonian 8,150 ft.

TABLE VI—Continued

Map Co-Ord.	Name of Well	County	Location		Depth (Feet)	Oldest Formation Penetrated	Results	Date Completed	Remarks
			Sec.	Blk.					
A-10	Dodson, Texas American Synd. 1	Brewster	60	10	GH&SA	Ellenburger	D&A		Frontier wildcat Hovey area. Temporarily abandoned, May, 1938, in Simpson. Deepened to Ellenburger, reached at 8,365 ft.
G-15	Helmerich & Payne, D. S.	Cochran	19	Lge. 97	Brewster Co.	San Andres	P. 369	7/12	2½ miles NW. extension Slaughter field.
G-15	Wright Iron Prod. Co.,	Cochran	18	Lge. 60	Midland	San Andres	P. 287	8/10	4-mile NW. extension Slaughter field.
G-15	M. N. Clouser 1	Cochran	9	Lge. 64	CSL	San Andres	B/D.		2½ mile N. extension Slaughter field.
G-5	E. Constantine Jr.,	Cochran	9	Lge. 64	CSL	San Andres	P. 253	3/31	
G-5	G. W. Moore 1	Cochran	9	Lge. 64	CSL	San Andres	B/D, plus 67% wtr.		
G-5	John I. Moore	Crane	42	32	PSL	Clear Fork	P. 191	2/29	Discovery well Barnsley field (see text).
H-4	F. C. Barnsley Est. 1	Crane	16	35	H&TC	Ellenburger	D&A	5/5	Wildcat on Central Basin platform extreme SE part of county. Top Simpson 4,970, top Ellenburger 5,800 ft.
G-6	Schermerhorn,	Crane	7	B-22	PSL	Clear Fork	F. 214	5/12	1½ mile NW. extension Sand Hills Clear Fork production.
I-4	M. B. McKnight 1	Crane	46	35	H&TC	Simpson	B/D	8/3	Wildcat in SE. part of county, 4 miles from McCamey field. Base Permian 5,200, top Devonian 5,700, top Stanton 5,850, top Montoya 5,900, top Simpson 5,915 ft. Discovery well Crosssett field (see text).
G-6	Gulf, W. N. Waddell 43-E	Crane	20	B-26	PSL	Ellenburger	F. 1,275 B/D	4/19	4½ miles NE. Ellenburger production in Sand Hills field. Tested water at total depth 5,881 ft.; plugged back to 5,851 ft. for completion (see text).
G-6	Gulf, W. N. Waddell 45	Crane	27	B-26	PSL	San Andres	F. 11,741 B/D	2/24	Discovery well Sand Hills McKnight field (see text).
G-6	Magnolia, Katie W. Lea 8	Crane	3	32	PSL	Clear Fork	F. 519 B/D	12/13	Established upper San Andres production on E. flank Sand Hills structure. Failure in Clear Fork. Plugged back to 3,350 ft., and completed flowing through perforations in 7-inch casing from 3,120-3,200 ft. (see text).
L-3	Phillips, Schnee 1	Crockett	46	BB	TC RR	Ellenburger	D&A	9/15	Ordovician test 3 miles SW. World pool. Well 9,620 ft. Permian markers. Top of Ellenburger 9,620 ft.
J-3	Watchorn Oil Co., G. L. Thompson 1	Crockett	73		I&GN	Ellenburger	D&A	9/16	Pre-Permian test on NE. flank Yates structure. Thick Wolfcamp section overlying Simpson. Top Simpson 6,665, top Ellenburger 7,380 ft.
L-3	Amerada, Todd 5-A	Crockett	25	WX	GCS&F	Ellenburger	F. 7,184 B/D	8/22	Established Ellenburger production for Todd structure. Tested 535 bbls. oil per day from Ellenburger top at depth of 6,144 ft. Plugged back to Strawn limestone and completed.
B-5	Standard, Grisham-Hunter Corp. (Ac't 2) 1	Culberson	16	55	PSL	Bone Spring	D&A	6/4	Wildcat on W. flank Delaware basin.

TABLE VI—Continued

Map Co-Ord.	Name of Well	County	Location		Depth (Feet)	Oldest Formation Penetrated	Results	Date Completed	Remarks
			Sec.	Blk.					
B-5	Humble, Reynolds Cattle Co. 1-B	Culberson	33	62	PSL	5,417	Cambrian	D&A	11/1
K-11	Seaboard, A. J. Sprayberry 1	Dawson	38	34	Twp 5-N T&P	7,625	Wolfcamp (?)	D&A	3/21
K-12	Gulf, C. S. Dean 1	Dawson	30	1	J. Poirevent	10,455	Pennsylvanian	D&A	9/12
O-15	Humble, Matador Land & Cattle Co. 1-F	Dickens	10	AS	J. A. Calloway	6,987	Pennsylvanian	D&A	3/8
O-16	Seaboard Oil Corp., Pitchfork Land & Cattle Co. 1	Dickens	93		RR Indianola	5,005	Pennsylvanian	D&A	4/8
H-7	Shell, J. L. Johnson 1	Ector	37	44	Twp 1-S T&P	7,000	Wichita (?)	Temp. Aban.	4/15
H-8	Stanolind, Cowden 1-B	Ector	12	44	Twp 1-N T&P	10,829	Mississippian (?)	D&A	5/15
G-8	Shell & Cities Service, TXL 1	Ector	7	45	Twp T&P	10,181	Ellenburger	F 2,011 B/D	
M-17	Pure, Bernard Martin 1	Floyd	7	T	BS&F	5,500	Wichita (?)	D&A	5/5
F-11	Humble, R. A. Cox et al. 1	Gaines	14	A-11	PSL	11,651	Devonian	D&A	3/21
H-11	Honolulu, E. M. Homann 1	Gaines	96	G	WT RR	5,457 PB 3,513	San Andres	5,512,000 CFG	4/7
G-11	Humble, Fee et al. 1	Gaines	9	A-24	PSL	9,040 PB 7,086	Pennsylvanian	F 210 B/D	11/28
H-10	Texas Co., Parmer 1	Gaines	5	Lge. 317	Parmer CSL	8,097	Permian	D&A	1/15
L-13	Honolulu & Devonian, D. R. Payton 1	Garza	1421		TT RR	3,768 PB 3,595	San Andres	P. 131 B/D plus 30 B wtr	8/19
K-16	Amerada, W. N. Kurfes 1	Hale	6	N	H&OB	10,350	Pre-Cambrian	D&A	2/8
H-16	Stanolind, Tom Cobb 1	Hockley	103E	Lge. 75	Haskell CSL	4,685 PB 4,663	San Andres	P 61 B/D plus 19 B wtr	4/18

TABLE VI—Continued

Map Cor- Ord.	Name of Well	County	Location		Depth (feet)	Oldest Formation Penetrated	Results	Date Com- pleted	Remarks
			Sec.	Blk.					
L-9	J. B. Hawley, Wilkenson 1	Howard	33	34	Twp 1-N T&P	San Andres	P 13 B/D plus 7 B wtr.	1/26	Discovery well Morita field (see text).
M-10	Guthrie & Coston, Pauline Allen 1	Howard	57	20	LaVaca Twp 1-S	Clear Fork	P 36 B/D	4/25	Discovered new "pay" in lower Clear Fork in Vincent pool (see text).
M-9	Harrison & Foster, D. A. Snyder 1	Howard	20	30	Twp 1-S T&P	Clear Fork	P 45 B/D	9/6	1 1/2 miles W. of production in Jatan-East field.
N-4	Shel, Tankersley Est 1	Irion	12		GC&SF	Cambrian	D&A	9/26	Drilled through Ellenburger into Cambrian sandstone, reached at 8,304 ft. Top Ellenburger 7,349 ft.
M-5	Humble, Sawyer Cattle Co. 2-B	Irion	3		O. G. Coulson	Ellenburger	D&A	2/15	Exploratory well in Midland basin in NW. part of county. Sulphur water in Ellenburger, reached at 8,600 ft.
I-16	Woodley Pet. Co., W. E. Bird 1	Lamb	66	T	T. A. Thompson	Wichita	D&A	11/30	Wildcat in SE. part of county. Top Clear Fork 7,265 ft.
I-16	Humble, Jackson 1	Lamb	19	1	R. M. Thompson	Pre-Cambrian	P 24.8 B/D plus .94 B wtr	12/28	Pre-Cambrian under Wolfcamp at 7,185 ft. Plugged back to 6,815 ft. in Clear Fork for completion. Discovery well Anton pool (see text).
K-14	Sohio, A. A. Rinne 1	Lynn	262	L	BS&F	Clear Fork	D&A	4/30	Wildcat in NE. part of county.
K-13	Texas Co., K. V. Rummel 1	Lynn	451	1	EL&RR	Wichita (?)	D&A	10/4	Wildcat in SW. part of county. Top San Andres 6,060 ft.
T-14	Sohio, Allsup 1	Lynn	113	12	EL&RR	Wichita (?)	D&A	3/9	Wildcat in NW. part of county. Top San Andres 3,910 ft. Top Clear Fork (?) 5,620 ft.
J-7	Barnesdall, Wilson Bryant 1	Midland	36	39	Twp 3-S T&P	Clear Fork	D&A	5/24	Midland basin wildcat in S. central part of county.
I-8	Stanolind, Midland Farms 1	Midland	34	40	Twp 1-N T&P	San Andres	D&A	5/30	Wildcat in SW. part of county. Sulphur water in Ellenburger, reached at 7,425 ft.
N-8	Shamrock, Ellwood Est 1	Midland	19	17	SP&R	Ellenburger	D&A	2/9	Failure in Westbrook Clear Fork "pay"
M-10	Col-Tex, Earl Morrison 18	Mitchell	21	28	1-N Twp T&P	Clear Fork	P 20 B/D plus 5 B wtr	3/1	Perforated 2,410 to 2,400 and completed in San Angelo, new "pay" in Westbrook field. Ellenburger failure 6 miles E. of Westbrook field. Top Ellenburger 7,750 ft.
N-10	Humble, Pruitt Keel 1	Mitchell	22	27	T&P	Ellenburger	D&A	12/30	Ellenburger failure in Westbrook field. Top Ellenburger 7,750 ft.
M-10	Col-Tex, H. C. Miller 1	Mitchell	22	28	Twp 1-N T&P	Ellenburger	D&A	6/26	Ellenburger failure in Westbrook field. Top Ellenburger 7,750 ft.
H-4	Humble, O. L. Barnes 1	Pecos	120	10	H&GN	Ellenburger	D&A	1/24	Wildcat 5 miles E. of Apco pool. Sulphur water in Ellenburger, reached at 4,340 ft.
G-3	McCandless, Atlantic Refg. Co. 1-10	Pecos	10	41	T&SL	Pre-Cambrian	D&A	1/19	3 miles S. of Apco field. Top pre-Cambrian 4,710 ft.
F-3	Humble, O. W. Williams 1	Pecos	3	114	GC&SF	Seven Rivers	F 22 B/D	8/22	Discovery well Ft. Stockton pool. Plugged back to 2,892 ft., and completed from Yates. About 1 mile S. of Apco field. Top Ellenburger failure 5 1/2 miles SE. Heiner pool.
G-3	Humble, State Nat'l Bank of El Paso 1	Pecos	7	140	T&SL	Ellenburger	D&A	12/1	Top Ellenburger 8,240 ft.

TABLE VI—Continued

Map Co- Ord.	Name of Well	County	Location			Depth (Feet)	Oldest Formation Penetrated	Results	Date Com- pleted	Remarks
			Sec.	Blk.	Survey					
H-3	Humble, B. F. Smith 1	Pecos	12	145	T&SL	5,175	Pre-Cambrian	D&A	6/18	2 1/2 miles NW. MacDer gas area. Pre-Cambrian at 5,140 ft. Chancellor field in Delaware basin. Salt water from Delaware Mountain formation, reached at 4,493 ft.
E-2	Humble Mrs. T. P. Kennedy 1	Pecos	81	3	T&P	4,685	Delaware Mountain	D&A	8/8	Regionally low, 9 miles NE. Ft. Stockton.
G-3	Humble, H. O. Word Est. 1	Pecos	4	5	TC RR	9,150	Pennsylvanian	D&A	8/21	Wildcat 3 1/2 miles SE. Apo-Warner pool.
H-3	Phillips, Iowa Realty Trust 1	Pecos	130	10	H&GN	4,178	Ellenburger	D&A	4/16	Wildcat 3 1/2 miles SE. Apo-Warner pool. Ellenburger, at 4,060 ft., contained sulphur water.
H-4	Phillips, Pascoe 1	Pecos	114	11	H&GN	4,645	Pre-Cambrian	D&A	2/19	0 1/2 miles NW. MacDer gas area. Pre-Cambrian at 4,610 ft. Pennsylvanian at 4,545 ft.
H-3	Phillips, Univ.-Pecos 1	Pecos	1	20	Univ.	7,384	Ellenburger	D&A	3/31	Ellenburger failure, 5 miles W. Taylor-Link field. Top Wolfcamp 5,010, top Simpson 6,120 top Ellenburger 7,130 ft.
H-3	Debs Patillo, Iowa Realty Trust 1	Pecos	61	10	H&GN	1,477 PB 1,356	Seven Rivers	F.27 B/D plus 7 B wtr	5/1	3 miles S. extension Lehn pool (see text).
H-3	Standard of Texas, MacDer 1	Pecos	4	228	A&NW	5,215	Pre-Cambrian	CHG plus 100,000	3/20	Discovery well MacDer gas field (see text).
F-5	Standard of Texas, ElTrees 2	Pecos	27	8	H&GN	8,232	Permian	D&A	8/20	Wildcat on E. flank Delaware basin. Probably still in Permian at total depth.
G-4	Texas Co., Mrs. A. B. C. Alexander 1	Pecos	82	10	H&GN	5,864	Ellenburger	D&A	6/28	Ellenburger reached at 5,935 ft. Water in Wildcat reached at 5,935 ft. Failure in Ellenburger, reached at 4,485 ft.
H-4	Culbertson & Irwin, O. L. Barnes 1	Pecos	134	10	H&GN	4,452	Ellenburger	D&A	7/26	Wildcat 3 1/2 miles S. Big Lake field (see text).
K-4	Superior & Wiggins & Hyde, University 1-A	Reagan	25	8	Univ.	3,175	Grayburg	P.61 B/D plus 114	6/5	Additional information in Delaware basin. Bone Spring at 6,920 ft. overlain by 3,035 ft. Delaware Mountain formation.
C-5	Standard of Texas, T. F. Kessler 1	Reeves	10	72	PSL	8,894	Bone Spring	D&A	1/15	Base Permian and top Devonian 6,725 ft. Pennsylvanian at 6,725 ft. Ellenburger reached at 9,355 ft.
G-6	Gulf, J. B. Edwards et al. 1-B	Ward	25	B-18	PSL	9,669	Ellenburger	D&A	5/29	Discovery well Lion pool (see text).
E-6	Lion Oil Refg. Co., University 1-B	Ward	43	18	Univ.	4,994	Delaware Mountain	F.122 B/D	10/26	Discovery well North Monahans pool (see text).
F-7	Stanolind, Sealy-Smith 1	Winkler	50	A	G&MMB&A	6,005	Clear Fork	F.298 B/D	3/23	Deep failure 4 1/2 miles SE. Kermit. Structurally at least 400 ft. below Permian.
F-7	Sindair-Prairie, Seth Campbell 1	Winkler	11	B-5	PSL	12,395	Ellenburger	D&A	7/22	Entered Ellenburger, which contained water, at 12,030 ft.

TABLE VII
IMPORTANT DRILLING WELLS—WEST TEXAS, DECEMBER 31, 1944

No. on Map Co. Map Ord.	Name of Well	County	Location		Depth (Feet)	Remarks
			Sec.	Blk.		
1	G-9 Magnolia, J. B. Martin 1	Andrews	13	A-47	PSL	6,895
2	G-10 Magnolia, B. B. Ralph 1-A	Andrews	12	A-37	PSL	8,927
3	F-9 Humble, E. M. Jones 1	Andrews	17	A-40	PSL	3,748
4	G-9 Fenrose, J. E. Parker et al. 1	Andrews	111	D	J. Hobell	7,810
5	F-9 Shell & Texas Co., Ratliff & Bedford 1	Andrews	4	73	PSL	PH 4,595 6,221
6	G-9 Stanolind, University 1-D	Andrews	8	11	Univ.	10,164
7	G-9 Stanolind, University 1-P	Andrews	44	13	Univ.	6,200
8	G-9 Sun Oil Co., N. C. Martin et al. 1	Andrews	17	A-41	PSL	5,848
9	F-10 Union Oil Co. of Calif., J. D. Biles 9	Andrews	19	A-32	PSL	8,350
10	L-11 Northern Ordnance, Clayton-Johnson 1	Borden	32	31	Twp 4-N T&P	9,498 PH 3,864
11	K-11 Texas Co., W. D. Johnson 1	Borden	41	32	Twp 4-N T&P	7,540 PH 7,055
12	G-14 Honolulu, Hudson 1-9	Cochran	9	P	PSL	5,154
13	G-16 Stanolind, Elma L. Slaughter 1	Cochran	49	Lge. 101	Jeff Davis CSL	8,761
14	H-5 Atlantic, University 1-A	Crane	33	31	Univ.	250
15	G-6 Gulf, John Edwards et al.	Crane	11	B-18	PSL	2,400
16	G-6 Gulf, M. B. McKnight 6-E	Crane	20	B-17	PSL	7,583 TD
17	G-6 Sinclair-Prairie, J. McKnight 1	Crane	6	B-22	PSL	7,583
18	H-4 Sun Oil Co., J. B. Roberdeau 1	Crane	19	35	H&TC	300
19	L-2 Richfield Oil Co., Archie Bean 1	Crockett	13	UV	G&SF	2,722
20	K-3 Sohio Pet. Co., J. S. Todd Est. 1-A-14	Crockett	14	D-15	EL & RR	5,410
21	M-14 Rodgers Bros. Drig. Co., W. H. Belding et al. 1	Crosby	4	D-15	W. W. Watts	2,503

Pre-Permian test, 61 miles S. of Fullerton field. Top San Andres 4,570 ft.
Ellenburger test on seismic prospect 1 mile W. production Fullerton field. Failure in Devonian. Top Devonian 8,140 ft.
Deep wildcard on postulated trend SE. Drinkard pool. Failure in Permian. Top Permian 7,810 ft.
Deep test in Mascho field. Failure in Clear Fork. Plugged back to test San Andres.
Ellenburger wildcard on seismic prospect 9 miles W. Embury pool.
Ellenburger wildcard on seismic prospect 4 miles NW. Embury pool. Important showings in lower Permian and lower Devonian. Top Permian 7,995 ft.
Pre-Permian test 21 miles N. of W. Andrews field. Seismic prospect.
Scheduled Ordovician test 21 miles NW. of W. Andrews field.
Devonian test on NW. flank Union field. Drilling in lower Leonard.
Permian exploratory well SW. part of county. Top of Ellenburger 9,450 ft. Water in 49 feet Ellenburger penetrated.
Deep exploratory well in SW. part of county. In Pennsylvanian at total depth.
San Andres wildcard 3 miles SW. Slaughter field.
Pre-Permian test 7 miles NW. Dean pool. Drilling in Pennsylvanian. Top San Andres 3,816, top Glorita 3,816.
Scheduled Ordovician test between Sand Hills and McElroy fields.
Central Basin platform wildcard between Sand Hills and Monahans fields.
Ellenburger test on structural trend 5 miles NW. Sand Hills field. Entered Simpson above Ellens sand, reached Ellenburger at 7,435 ft. Drilling in Permian. Water in Ellenburger and oil and water from Simpson sands.
Ordovician test on Central Basin platform, 5 miles W. Jordan pool.
Devonian test 31 miles N. Devonian production in Wildcat 41 miles E. Strawn production in Todd field. Strawn limestone test 9 miles W. Todd production.
San Andres wildcard in S. part of county, 19 miles N. Garza pool.

TABLE VII—Continued

No.	Map on Map Ord.	Name of Well	County	Sec.	Blk.	Location	Depth (Feet)	Remarks
22	I-12	Richmond Drig. Co., J. W. Nelson et al. 1	Dawson	34	M	EL & RR	5,003	Wildcat 8 1/2 miles NE, Cedar Lake field. Showing for small producer in San Andres.
24	I-11	Texas Co., R. W. Higgenbotham Trust 1	Dawson	16	Lge. 279	Hutchinson CSL	PB 4,922	Wildcat 10 miles SE, Cedar Lake field.
25	G-7	Phillips, TXL 1-A	Ector	21	45	Twp 1-S T&P	3,500	Pre-Permian wildcat 1 1/2 miles SE, of discovery well of TXL field.
26	H-8	Stanolind, Midland Farms 1-L	Ector	36	41	Twp 1-N G&MMB&A	4,915	Exploratory well for Grayburg-San Andres production in NW 1/4 of N. 1/2 Sec. 36, Twp 1-N, R. 1-E, S. 1-E, Ector field.
27	G-7	Rowan Drig. Co., T. P. Land Trust 1	Ector	29	45	Twp 1-N G&MMB&A	4,001	Pre-Permian test, 2 1/2 miles S. Shell-Cities Service Devonian discovery in W. part of county.
28	G-8	Texas Co. & Phillips, J. F. Cowden 1	Ector	7	44	Twp 1-N T&P	7,406	Lower Permian test 3 miles N, Goldsmith field.
29	G-7	Texas Co., G. C. Fraser 1-B	Ector	31	45	Twp 1-S T&P	8,133	Ellenburger test in extreme W. part of county. Showings of gas and oil from Mississippian, topped at 7,863 ft.
30	F-12	Amerada, E. H. Jones 1-A	Gaines	3	A-6	PSL	4,206	Central Basin platform wildcat 6 miles W. Wasson field.
31	G-11	Shell Oil Corp., T. K. Sparks 1	Gaines	3	A-13	PSL	10,604	Wildcat in SW. part of county. Stopped in Devonian. Top Pennsylvanian 8,920, top Mississippian black shale, 8,970, top Devonian (?) 9,080 ft.
32	F-11	Bay Petroleum Co., B. Cox et al. 1	Gaines	468	G	CS&D&RGNG	5,223	Wildcat midway between Seminole and Hobbs fields. Scheduled pre-Permian test in extreme SW. part of county.
33	F-10	Synclaire-Fralter, W. L. Johnson	Gaines	16	A-8	PSL	3,687	San Andres test 2 miles NE, of discovery well of PHD pool.
34	L-13	Honolulu & Devonian, Elmer Hitt 1	Garza	2	I	HE&WT	3,314	Pre-Permian test 1 mile SW, Howard-Glasscock field.
35	L-8	Phillips, McDow 1	Glasscock	31	34	Twp 2-S T&P	6,518	Midland basin wildcat in NW. part of county.
36	K-7	Richfield Oil Corp., Lois Blaylock 1	Glasscock	7	35	Twp 3-S T&P	3,991	Wildcat 7 miles N, Slaughter field. Showing for a small well in Slaughter "pay" of San Andres. Top San Andres 3,750 ft.
37	H-15	Texas Co., L. Y. P. Montgomery 1	Hockley	19	Lge. 70	Val Verde CSL	4,890	3 miles NE, discovery well Yellowhouse pool.
38	H-16	Stanolind, Yellowhouse Land Company 1	Hockley	2	Lge. 713	State Capitol Lands	3,776	Pre-Permian test Howard-Glasscock field.
39	I-15	Woodley Pet. Co., D. L. Elwood 1	Hockley	26	A	R. M. Thompson	3,799	Wildcat near N. county line.
40	L-8	Continental, W. R. Settles 1-D	Howard	133	29	W&NW	7,856	Pre-Permian test Howard-Glasscock field.
41	L-10	Herman Brown et al., J. C. Caldwell 1	Howard	32	32	Twp 3-N T&P	6,042	Pre-Permian wildcat in NW. part of county. Plugged back to test showings in Clear Fork.
42	K-10	Northwestern Ordnance, Spaulding 1	Howard	7	33	Twp 2-N T&P	7,202	Pre-Permian wildcat in extreme NW. part of county. Showings of oil in Pennsylvanian limestone.
43	N-14	A. A. House 1	Kent	8	B	PSL	7,774	Wildcat 12 miles W. of Humble, No. 1, Jackson, discovery well of Anton pool.
44	N-12	Sohio Pet. Co., W. A. Mays 1	Kent	44	4	H&GN	2,502	Pre-Permian wildcat in extreme NW. part of county. Showings of oil in Pennsylvanian limestone.
45	I-16	Humble, R. L. Bagwell 1	Lamb	25	Lge. 673	State Capitol Land	Loc.	Wildcat in S. central part of county.
46	L-15	Magnolia Pet. Co., L. D. Johnson 1	Lubbock	88	C	D&WC	9,471	Deep exploratory well in N. part of county. Drilling in Permian.
47	J-16	Seaboard & Stanolind, L. M. Cravens 1	Lubbock	16	D	L&SV	8,800	Wildcat in N. part of county. Drilled to 8,800 ft. and plugged back to test showings in Clear Fork.
48	K-13	Phillips, Bartley 1-A	Lynn	1372	I	EL&RR	PB 6,170 9,009	Deep wildcat in W. part of county. Penetrated to pre-Cambrian with no important showings. Top Strawn (?) limestone 8,700, top Mississippian 9,050, top Ellenburger 9,350, top Cambrian sandstone 9,850, top pre-Cambrian 9,900 ft.
49	J-14	Texas Co., M. C. Edwards 1	Lynn	158		GRR	5,435	Lower Permian test in NW. part of county.

NEW PERMIAN PAY ZONE

H-3—MacDer gas field.—One new Permian pay zone was discovered in 1944 with the completion of the Standard Oil Company of Texas' MacDer Company No. 1, Sec. 36, Block 144, T&StL Survey, in northern Pecos County, about 6 miles south of the town of Owego. This well, drilled 2 feet into the pre-Cambrian at its total depth of 5,312 feet, found Wolfcamp beds underlying the Leonard at 4,700 feet. It was plugged back to 4,730 feet and after perforating casing from 4,706 to 4,730 feet was completed in Wolfcamp dolomite for a potential of 10,900,000 cubic feet of sweet gas daily. This was the first Wolfcamp production in the West Texas-southeastern New Mexico area. At the end of the year 2 additional gas wells had been completed, both of which had penetrated to the pre-Cambrian. This structure appears to be large, and Ordovician production may develop on the flanks as it is defined. This field was discovered by subsurface geology.

OTHER PERMIAN DEVELOPMENTS

I. UPPER DELAWARE MOUNTAIN, YATES AND SEVEN RIVERS

E-6—Lion pool.—The Lion pool, the only new producing area in the Delaware basin, was discovered by the Lion Oil Refining Company's University No. 1-B, in Sec. 43, Block 18, University Lands, Ward County. This well, drilled as a result of subsurface geology, was completed in October, flowing 122 barrels of 35° gravity oil in 24 hours. It is producing from the upper part of the Delaware Mountain sandstone from 4,979 to 4,994 feet. At the end of the year, 5 wells were drilling in the area, but as none had penetrated to the Delaware Mountain section, insufficient information is available properly to evaluate this discovery.

F-3—Fort Stockton pool.—The Fort Stockton pool, in Pecos County, 5 miles northwest of Fort Stockton, was discovered by the Humble Oil and Refining Company's O. W. Williams No. 1, in Sec. 3, Block 114, GC&SF Survey. The well was drilled to 3,604 feet and later plugged back to 2,892 feet, and 5½-inch casing perforated from 2,840 to 2,880 feet in the Yates sandstone. On official gauge, it flowed 22 barrels of 35.7° gravity oil in 24 hours. Subsequent drilling has revealed the presence of about 80 feet of broken "pay" in the Yates section. A test ¾ mile south of the discovery well—Humble's Williams No. 3—drilled through a normal Yates sandstone and reef dolomite section, found the Delaware Mountain sandstone dry at 4,878 feet, and was plugged back and completed in the Yates section for a small producer. There were 4 producing wells in the area at the end of the year. This field was located by subsurface geology, supported by detailed surface mapping.

H-11—Homann.—The only other Yates discovery during 1944 was made by the Honolulu Oil Corporation's E. M. Homann No. 1, in Sec. 96, Block G, WT RR Survey, Gaines County. This well was drilled to 5,457 feet in the San

Andres section in 1943, and failing to secure production, was plugged back to 3,475 feet and shut in. It was officially completed in April, 1944, flowing 5,512,000 cubic feet of gas with some distillate daily from the lower Yates section. It has not been produced. The structure on which it is located was indicated by subsurface geology supported by geophysical information.

G-4—Debs Patillo, Iowa Realty Trust No. 1.—This well, in Sec. 61, Block 10, H&GN Survey, 3 miles south of the Lehn pool, was completed in May, flowing 24 barrels of oil and 7 barrels of water in 24 hours. It is producing from Seven Rivers dolomite from 1,262 to 1,356 feet. The top of the Yates section is 1,155 feet. This minor discovery is classed as an extension to the Lehn pool.

2. GRAYBURG FORMATION

Two new areas of Grayburg production were discovered in 1944, both of which were classed as extensions to established fields. The number of important Grayburg discoveries has been declining steadily for several years because of the lack of undrilled prospects along the east margin of the Central Basin platform, where most of the Grayburg production is located.

H-8—Midland Farms.—The Stanolind Oil & Gas Company's Midland Farms No. 1-F, Sec. 1, Block 42, Township 2 North, G&MMB&A Survey, Andrews County, located in the Midland basin, 7 miles northeast of the North Cowden field, was drilled to 4,942 feet and plugged back to 4,880 feet to shut off water. It was completed in June for a pumping potential of 548 barrels of 31.6° gravity oil and 4 barrels of sulphur water per day. The producing section from 4,820 to 4,880 feet is in the lower Grayburg and possibly upper San Andres formation. Subsequent wells have shown that about 90 feet of producing section is present in the area, and it apparently represents a substantial reserve. Four wells had been completed by the end of the year. This is a seismograph discovery.

H-10—Sun Oil Company's Gardner No. 1.—Grayburg production was established $1\frac{1}{2}$ miles west of the Means field (*H-10*) in Andrews County with the completion in July of the Sun Oil Company's Gardner No. 1, in Sec. 17, Block A-35, PSL Survey. This well, which rated an initial production of 232 barrels of oil, flowing, in 24 hours, was drilled to 4,562 feet. It encountered broken "pay" from 4,370 to 4,562 feet in the Grayburg and in the upper part of the San Andres formation, the top of which was reached at 4,525 feet. Two offset wells had been completed by the end of the year. The area was classified as an extension to the Means field.

In Reagan County, the Superior Oil Company of California and Wiggins and Hyde's University No. 1-A (*K-4*), Sec. 25, Block 8, University Lands, was drilled to 3,175 feet in the Grayburg formation and completed in June, pumping 61 barrels of oil and 114 barrels of water in 24 hours. Although removed 3 miles northwest, this well was classed as an extension to the Grayson pool.

FIELD DEVELOPMENT

During the year, the Mabee field, in Andrews County (I-9), in which only the discovery well was producing in January, was expanded in all directions without a failure and 32 wells had been completed by December 31. The North Cowden field, in Ector County (H-8), received progressive extensions north and northwest. The Shannon field, in Crockett County (L-3), also expanded.

3. SAN ANDRES FORMATION

G-6—Sand Hills McKnight.—This new "pay" in the northeastern part of the Sand Hills field, Crane County, was discovered by the Gulf Oil Corporation's W. N. Waddell No. 45, in Sec. 27, Block B-26, PSL Survey. At its total depth of 3,230 feet, the well blew out after losing circulation from 3,144 to 3,190 feet, and difficulty was experienced in controlling it. It was completed in February, flowing 11,471 barrels of 35.2° gravity oil per day through 6 $\frac{5}{8}$ -inch casing and open 2-inch tubing. This zone, from which several light wells northwest of the field produce, is the lower part of the San Andrew formation. Further exploration has revealed the presence of about 100 feet of effective "pay." It appears probable that production from the McKnight pay will be confined to the northeast flank of the Sand Hills structure. Five wells were completed in the area during the year.

H-16—Yellowhouse field, Hockley County.—The Yellowhouse field, of northern Hockley County, 15 miles north of the east end of the Slaughter field, was discovered by Stanolind Oil and Gas Company's Tom Cobb No. 1, Labor 103-E, League 75, Haskell County School Land. Located on a seismic prospect, with limited subsurface information, the discovery well was drilled to 4,685 feet in the San Andres formation, the top of which was found at 3,610 feet. After testing oil and water at that depth, the well was plugged back to 4,663 and completed in April with a pumping potential of 61 barrels of 27° gravity oil and 9 barrels of water in 24 hours. Another small pumping well was completed during the year.

L-13—PHD field, Garza County.—The Honolulu Oil Corporation and Devonian Oil Company's Payton No. 1, located in Sec. 1421, TT RR Survey, in northwestern Garza County, was completed in August with a pumping potential of 131 barrels of 38.1° gravity oil and 30 barrels of water in 24 hours. The well was drilled to 3,768 feet in the San Andres formation, and plugged back to 3,565 feet in an unsuccessful attempt to shut off formation water. A test in the same section, east of the discovery well, was a failure. Credit for this discovery may be given to regional subsurface geology and seismic information.

G-6—Upper San Andres zone, Sand Hills field.—With the completing of Magnolia Petroleum Company's Katie W. Lea No. 8, Sec. 3, Block 32, PSL, a new pay zone in the upper part of the San Andres formation was established on the east flank of the Sand Hills structure, Crane County. This well, drilled to 4,991 feet, was low structurally and a failure in the Tubb zone. It was plugged back to 3,350 feet to test shows in the upper San Andres and was completed in

December with a flowing potential of 519 barrels of 35.1° gravity oil in 24 hours. This discovery is of considerable importance since it indicates the presence of a belt of upper San Andres production on the east flank of the Sand Hills structure.

OTHER SAN ANDRES DEVELOPMENTS

The Morita pool (*L-9*) in Howard County, discovered by J. B. Hawley's Wilkenson No. 1, in January, appears relatively unimportant. Three scattered wells—all small pumpers—had been completed by the end of the year.

The Slaughter field (*H-14*), in Cochran and Hockley counties, received minor extension on the east and west sides, and important successive extensions, totalling 4 miles, toward the northwest.

In Andrews County, three San Andres exploratory tests in the Shafter Lake area were completed as small pumping wells.

HOLT ZONE DEVELOPMENTS

The only new locality of Holt zone production was discovered by The Texas Company's Magnolia-University No. 1-L, in Sec. 41, Block 9, University Lands, 1¼ miles east of the Emma pool (*H-8*), completed in October with a flowing potential of 541 barrels of oil and some water. This well is important in that it reveals the presence of an area of Holt zone production on the east flank of the Emma structure. This discovery, which was assigned to the Clabberhill pool, was found by subsurface geology supported by seismic information.

The Keystone-Holt area, in Winkler County (*F-7, 8*), was expanded from 1 to 9 flowing wells during the year, and now represents a very important reserve extending for 2½ miles along a northwest-southeast trend.

4. DEVELOPMENTS IN CLEAR FORK

I-16—Anton field, Lamb County.—The Anton field was discovered in December by the Humble Oil and Refining Company's J. A. Jackson No. 1, Sec. 19, Block 1, R. M. Thompson Survey, in the southeastern part of the county. The well was drilled to 7,191 feet in pre-Cambrian, reached at 7,185 feet. A total of 380 feet of Wolfcamp beds were penetrated above the basement rock. Production was found in broken "pay" in the Clear Fork section from 5,500 to 6,030 feet. The well was plugged back to 6,036 feet, and rated an initial production of 248 barrels of oil and 94 barrels of water, pumping, per day. This discovery is the result of seismic work and regional subsurface geology. It is the northernmost production in the district.

F-7—North Monahans field, Winkler County.—This discovery was made by the Stanolind Oil and Gas Company's Sealy and Smith Foundation No. 1, Sec. 50, Block A, G&MMB&A Survey, in southeastern Winkler County. Production is from the Tubb zone of the Clear Fork. The discovery well, drilled to 6,305 feet and plugged back to 6,248 feet, rated an initial flowing potential of 298 barrels

of 37° gravity oil in 24 hours. Subsequent drilling has revealed the presence of about 100 feet of broken "pay" section. During the year, three additional producing wells and two failures—both on the east flank of the structure—were drilled. This field was discovered as a result of seismic investigation.

G-11—Doss pool, Gaines County.—Humble Oil and Refining Company's Fee et al. No. 1, Sec. 9, Block A-24, PSL Survey, 7½ miles southwest of the Seminole field, was located on a known subsurface structure. It was drilled to 9,049 feet in Pennsylvanian beds, and plugged back to 7,080 feet for completion in the Clear Fork. The well was completed in November, rating an initial production, after treatment with 7,000 gallons of acid, of 210 barrels of oil in 24 hours, flowing. As this discovery is on a large structure, it may represent an important reserve.

OTHER CLEAR FORK DEVELOPMENTS

The Barnsley pool (*G-5*), 2½ miles southeast of the Sand Hills field, in Crane County, has had no additional development since discovery (Table V) in February. It may represent an extension to the Sand Hills field.

Clear Fork production was indicated in the Crossett pool, Crane County (*I-4*), when The Texas Company's Hobbs No. 3-B, in which the Devonian producing zone was missing because of truncation, was in the process of being completed as a flowing well from the Clear Fork section at the end of the year.

In Howard County, the Vincent pool (*M-10*) received a new but unimportant pay with the completion of Guthrie and Cosden's Allen No. 2, in the lower Clear Fork. This well, completed in April, pumped 36 barrels of oil on initial gauge.

The Fullerton field, Andrews County (*G-10*), experienced intense activity and was extended without a failure in all directions except to the west. The Union field (*F-10*) was extended to the north, south, and east, and it appears that the two fields may unite.

DEVELOPMENTS IN PRE-PERMIAN OF WEST TEXAS

Pre-Permian exploration in West Texas in 1944 was of greater magnitude than in any past year. The Central Basin platform was still the favored area, but pre-Permian tests also were drilled in the Northern Shelf area, on the Eastern platform, and in the Midland basin. Exploration along the western margin of the Central Basin platform, extending into New Mexico has been notable. Possibly the most important result of pre-Permian drilling in West Texas was the establishment of production from Devonian beds for the first time in the history of the area. The regional productive possibilities of the zone were assured by the discovery of widely separated Devonian fields in Crane, Ector, and Andrews counties.

DISCOVERIES

I-4—Crossett pool.—The Crossett pool, in southeastern Crane County, about 4 miles west of the old McCamey field, was discovered in August, by The Texas

Company's Hobbs No. 1-A, Sec. 46, Block 35, H&TC Survey. This well was drilled to 6,021 feet, in Simpson, and found Devonian underlying Permian at 5,267 feet. The usual sequence of Silurian and upper Ordovician beds were present above the Simpson, reached at 5,817 feet. The well was plugged back to 5,440 feet, and casing was perforated from 5,365 to 5,390 feet. After acid treatments totalling 3,500 gallons, it was completed for a flowing potential of 434 barrels of 45° gravity oil in 24 hours. Four wells had been completed at the end of the year, and one drilling well, The Texas Company's Hobbs No. 3-B, 1½ miles northwest of the discovery well, found the Devonian producing zone missing because of truncation. Credit for this discovery may be given to seismograph and subsurface geology.

G-10—Fullerton-Devonian.—The Mid-Continent Petroleum Corporation's University No. 1-7, Sec. 20, Block 13, University Land, 3 miles south of production in the Fullerton field (*G-10*), found water in the Fullerton Clear Fork "pay," and, after being deepened to 8,955 feet, was completed in the Devonian through casing perforations from 8,460 to 8,600 feet. After treatment with 1,000 gallons of acid, it flowed at the rate of 3,744 barrels of 40° gravity oil per day. The first Devonian beds were encountered at 8,255 feet, and the base of the Permian has been placed at 8,250 feet. Production is from porous, crystalline dolomite reached at 8,480 feet. As only one additional well had been completed in this area by the end of the year, the discovery can not be properly evaluated; however, it is possible that production may cover a large area. This is a seismograph discovery.

G-8—TXL pool.—The Shell Oil Corporation and Cities Service Oil Company's TXL No. 1, Sec. 7, Block 45, T. 1 S., Ector County, 2½ miles from the west county line, and 4 miles northeast of production in the Wheeler-Ellenburger pool had indicated prolific production from Devonian chert and dolomite in December, although the well was not officially completed until January 4, 1945. This well was drilled to 10,181 feet in Ellenburger, the top of which was found at 9,990 feet. A drill-stem test from 10,021–10,069 feet recovered 9,100 feet of sulphur water, eliminating Ellenburger possibilities. After unsuccessful attempts to obtain production from the Silurian section, the top of which was at 8,390 feet, the well was plugged back to 8,050 feet, and, in late December, flowed 200 barrels of oil in two hours through casing perforations from 7,886 to 8,020 feet. The official potential, taken January 5, 1945, was 1,911 barrels of 41° gravity oil in 24 hours. The gas-oil ratio was 873. Pre-Permian formations encountered in this well were as much as 741 feet higher than the Wheeler pool. The Mississippian black shales, underlying the Permian in the Wheeler pool, were not encountered in the TXL No. 1, which found Devonian beneath Permian beds at 7,840 feet. Production of commercial importance was also indicated in the lower Permian by a successful drill-stem test. Several wells were drilling in the TXL area at the close of the year, but none was deep enough to provide additional pre-Permian information. This discovery may be credited to subsurface geology, although limited seismograph control was available in the area.

ELLENBURGER DEVELOPMENTS

New Ellenburger production was assured in two areas in West Texas in 1944, and both developments apparently represent the discovery of important reserves.

G-6—Northeast Sand Hills, Crane County.—Gulf Oil Corporation's W. N. Waddell *et al.* No. 43-E, Sec. 20, Block B-26, PSL Survey, Crane County, $4\frac{3}{4}$ miles northeast of Ellenburger production in the Sand Hills field, was completed in April with an initial production of 1,275 barrels of 44° gravity oil per day. At its total depth of 5,881 feet, the well tested sulphur water and was plugged back to 5,851 for completion. Three wells had been completed in this area by the end of the year. This is a sursurface discovery.

L-3—Todd Deep field, Crockett County.—The other Ellenburger production found in 1944 was discovered by the Amerada Petroleum Corporation's Todd No. 5-A, Sec. 25, Block WX, GC&SF Survey, Crockett County. This well, in the northeast part of the Todd Deep field, was drilled to 6,285 feet, penetrating 43 feet of Ellenburger. The $5\frac{1}{2}$ -inch casing, set at 6,280 feet, was perforated from 6,130 to 6,210 feet, and the well flowed 310 barrels of 41.3° gravity oil in 14 hours. This production, the first from the Ellenburger on the Todd structure, was later plugged off and the well completed from Strawn limestone for a natural potential of 1,184 barrels of oil per day. Another well in the field, Amerada Petroleum Corporation's Todd No. 6-A, completed in November, also indicated commercial production in the Ellenburger. These developments will possibly result in dual completions in the Todd field at some future date.

The Keystone-Ellenburger field (*F-7, 8*), in Winkler County, one of the major discoveries of 1943, was increased from 1 to 12 wells during the year, and was extended one mile to the southeast. The Wheeler-Ellenburger field (*G-7*), in Winkler County, another very important 1943 discovery, was increased from 1 to 8 wells without failure in 1944.

The Barnhart field (*L-4*), in Reagan County, was extended about one mile north and northwest. As of January 1, the field consisted of 38 wells, 13 of which were completed in 1944.

DEVELOPMENTS IN SOUTHEASTERN NEW MEXICO

GENERAL

There were nine discoveries in southeastern New Mexico during the year 1944, four of which were of outstanding importance. The Yeso, Abo, and Ellenburger were revealed for the first time as reservoirs in this area, and a substantial addition was made to the reserves of the nation by the year's only San Andres discovery in New Mexico—the West Lovington field.

EXTENSIONS AND FIELD DEVELOPMENT

The wartime demand for crude stimulated field development to a considerable degree in certain of the younger fields of Lea and Eddy counties. By far the greatest number of field wells were drilled in the Grayburg-Jackson and Square

Lake fields, of Eddy County, and the Maljamar field, in western Lea County. The completion of the Malco's State No. 1, Sec. 31, T. 12 S., R. 32 E., in the Caprock area, for a flowing potential of 120 barrels of oil in 24 hours, gave impetus to a drilling campaign which expanded the field to its present total of nine producers.

A new but unimportant pay zone was found in the Turkey Track field (*B-11*) of Eddy County with the completion of McKee and Bassett's Spencer-State No. 1, Sec. 3, T. 19 S., R. 29 E., for a flowing potential of 15 barrels in 24 hours from the Queen formation (upper Permian). This well was drilled to water in the San Andres at 3,154 feet and plugged back to a depth of 2,163 feet. Small showings of oil were encountered in lower Seven Rivers sands.

A 2-mile westward extension to the Vacuum field (*D-11*) of central Lea County was indicated by the completion on September 8, 1944, of the Devonian's State No. 1, Sec. 32, T. 17 S., R. 34 E. This well, a submarginal pumper, was completed at a depth of 4,729 feet in the regular Vacuum Grayburg-San Andres zone for a potential of 36 barrels oil per day, swabbing through 2-inch tubing. Only slight additional development is expected to result from the drilling of this extension.

Early in July the New Mexico Federal Unit completed its Meyer A-29 No. 2, in Sec. 29, T. 22 S., R. 36 E., for a flowing potential of 96 barrels oil per day from porous reef-type dolomite of Yates (upper Permian) age. Although no further development had occurred up to the end of the year, it is believed this well may be the first in a narrow belt of production that will eventually link together the South Eunice (*E-10*) and Lynn (*E-9*) fields.

IMPORTANT NEW PERMIAN DISCOVERIES, SOUTHEASTERN NEW MEXICO

D-12—West Lovington.—Outstanding among the new discoveries in southeastern New Mexico, from the viewpoint of potential reserves, was the West Lovington strike. The discovery well, Fred Turner Jr.'s State "B" No. 1, was completed in June at a depth of 5,150 feet for a potential of 210 barrels of 34.5° gravity oil in 5 hours, flowing through a 2-inch casing outlet. The "pay" is in lenses of porous San Andres dolomite interfingering with barren streaks of the same material. This broken "pay" extends through a vertical section of approximately 375 feet. At the close of the year, 13 additional wells had been drilled in the area, some of which were capable of producing 100 barrels of oil per hour. Only one well has been stimulated by acid and none has been shot with nitroglycerine.

F-10—Drinkard-Yeso.—The Gulf Oil Corporation's Drinkard No. 1, discovery well of the pool, will be remembered as the first well in southeastern New Mexico to obtain commercial oil production from sediments of Yeso (Clear Fork) age. It was drilled to a depth of 6,508 feet and completed on October 25 for a potential of 782 barrels of 39° gravity oil in 14 hours, flowing through $\frac{3}{4}$ -inch choke on 2-inch tubing. Seven-inch casing was run to bottom and perforated from 6,375 feet to 6,460 feet. The formation was treated with 3,000 gallons of acid through

TABLE VIII
NEW DISCOVERIES IN SOUTHEASTERN NEW MEXICO, 1944

Map Co-Ord.	County	Location Sec. Twp. Rge.	Field	Operator	Farm	Date	Producing Formation	Pay Interval (Feet)	Initial	Discovery
C-11	Eddy	22 19S 31E	West Lusk	P. G. English	Hinkle 1	7-27	Yates	2,370-2,430	P. 8 B/D	Subsurface
A-11	Eddy	29 18S 27E	East Dayton	Martin Yates	Kaiser 1	12-4	Grayburg	1,395-1,483	P. 8 B/D	Subsurface
B-10	Eddy	29 20S 29E	Scanlon	Martin Yates	Stebbins 1	7-27	Tansill	700-710	5,700,000 CFG/D	Subsurface
E-11	Lea	8 20S 38E	Unnamed	DeKalb Agri. Ass'n.	Stovall 1	7-20	Yates	3,050-3,200	2,500,000 CFG/D	Subsurface
F-10	Lea	30 22S 38E	Drinkard- Yeso	Gulf Oil Corp.	Drinkard 1	9-8	Yeso	6,375-6,460	F. 782 BO 14 hrs.	Subsurface and seismograph
E-8	Lea	12 26S 37E	Dublin- Ellenburger	Humble O. & Rfg. Co.	Federal- Leonard 1	11-20	Ellen- burger	11,800-11,928	F. 297 B/D	Subsurface
E-10	Lea	23 20S 37E	Skaggs-Deep	N. Mex. Federal Unit	Skaggs B-23 2	12-20	Wolf- camp	7,700-7,725	F. 269 B/D	Subsurface and seismograph
C-11	Lea	22 19S 33E	Tonto	Texas Co.	Baskin 1	6-5	Seven Rivers	3,565-3,585	F. 254 B/D	Subsurface
D-12	Lea	4 17S 36E	West Lovington	Fred Turner, Jr.	State "B" 1	6-27	San Andres	4,710-5,150	F. 210 BO 5 hrs. thru 2" csg. out	Subsurface

TABLE IX
IMPORTANT EXPLORATORY WELLS COMPLETED, SOUTHEASTERN NEW MEXICO, 1944

Map Co-Ord.	Name of Well	County	Location Sec. Twp. Rge.	Total Depth (Feet)	Oldest Formation Penetrated	Results	Date Com- pleted	Remarks
B-14	DeKalb, J. P. White Co. 1	Chaves	35 10S 28E	7,515	Magdalena	D&A	2-1-44	Small showing in middle San Andres (2,550 ft.) scattered porosity in upper Yeso, first well in region to go below Yeso. Top of Magdalena 6,460 feet. Well penetrated in lower Magdalena (8,000 ft.) and produced from Yates formation through 1,000 feet igneous conglomeratic material into either basement crystalline or Tertiary laccolith, probably the former. Igneous conglomerate may be Abio in age. Hole full of salt water in Glorieta, top of Glorieta 1,860 ft.
	Humble, State 1-N	Chaves	35 14S 17E	4,014	Pre-Cambrian (?)	D&A	5-10-44	
	Danciger, State 1	DeBaca	26 15S 26E	2,035	Yeso	D&A	1-1-44	
	Danciger, State 1-A	DeBaca	8 25S 26E	1,890	Glorieta	D&A	1-4-44	

TABLE IX—Continued

Map Co. Ord.	Name of Well	County	Location Sec. Twp. Rge.	Total Depth (Feet)	Oldest Formation Penetrated	Results	Date Completed	Remarks
*C-11	P. B. English, Hinkle 1	Eddy	22 19S 31E	2,599 PB 2,435	Yates	P. 8 B/D	7-27-44	Discovery well of West Lusk field, 1½ mile W. extension to Lusk field. Producing from reef-type dolomite of Yates age.
B-10	McKee, Spencer- State 1	Eddy	3 19S 30E	3,157 PB 2,103	San Andres	F. 15 B/D	4-10-44	Oil showings in Seven Rivers, dry in Grayburg and San Andres. No oil production in Turkey Track.
A-11	Sanders Bros., Hultman 1	Eddy	32 16S 26E	6,761	Magdalena	Temporarily Abandoned	12- 2-44	Top of Queen 2,032 ft.
	Standard of Texas, Smith "23" 1	Eddy	23 22S 24E	3,901	Bone Spring	D&A	5-23-44	First deep test in region. Believed to have entered Abo (Wolfcamp) at 4,150 ft. Bottomed in Pennsylvanian sediments of Cisco age. Small showing of oil in Abo
A-10	Standard of Texas, Wilson "3" 1	Eddy	3 22S 25E	3,248	Brushy Canyon	D&A	5- 9-44	Penetrated Captain Reef and lower Delaware sand (Brushy Canyon) into underlying Bone Spring shales
B-12	Yates & Yates, Evans 3	Eddy	5 17S 30E	6,587	Abo	Temporarily Abandoned	2- 8-44	Penetrated 200 feet of Captain Reef and 100 feet of lower Delaware (Brushy Canyon). 8 miles W. of Carlsbad.
*A-11	Martin Yates, Kearney 1	Eddy	29 18S 27E	1,483	Grayburg	P. 8 B/D	12- 4-44	Deep test at extreme W. end of Square Lake field. Small showing of oil in San Andres. Top of Abo 6,440 ft.
*B-10	Martin Yates, Stebbins 1	Eddy	29 20S 20E	931 PB 730	Yates	5,700,000	7-27-44	Discovery well of East Dayton field. Pay 1,395-1,483 ft.
**E-11	DeKalb, Stovall 1	Lea	8 20S 38E	7,955 PB 4,055	Wolfcamp	2,500,000 CFG/D	7-20-44	Discovery well of Scanlon gas field. 3 miles W. of Gettysburg, producing from Tansill.
D-11 F-8	Devonian State El Paso Nat. Gas, Ginsberg 1	Lea	32 17S 34E 7 25S 38E	4,720 11,014	San Andres Montoya	S. 36 B/D Temporarily Abandoned	9- 8-44 5-30-44	Discovery well of Wolfcamp, water in Yesso and slight showing oil in Wolfcamp, water in Yesso and San Andres. Producing Yates gas through perforations at 3,639-3,200 ft.
*F-10	Gulf, Drinkard 1	Lea	30 22S 38E	6,508	Wichita	F. 782 BO	9- 8-44	Porosity in San Andres and Yesso. No showings of oil or gas. Rocks of Wolfcamp, Pennsylvanian, Mississippian, Devonian, Silurian and Montoya age.
*E-8	Humble, Federal- N. Mex. Fed.	Lea	12 26S 37E	11,969	Ellenburger	F. 297 B/D	11-20-44	Discovery well of Drinkard-Yesso field. First commercial Yesso production in New Mexico.
E-9	Unit A-20, Meyer (Pt.) 2	Lea	29 22S 36E	3,648	Yates	F. 96 B/D	7- 6-44	Discovery well of Duhon-Ellenburger field. Good showing of oil in San Andres.
*E-11	N. Mex. Fed. Unit B-23, Skaggs (Pt.) 2	Lea	23 20S 37E	10,645	Pre-Cambrian	F. 269 B/D	12-20-44	Producing from porous reef-type dolomite of Yates age. May be link between South Eunice and Lynn fields.
*C-11	Texas Co., Baskin 1	Lea	22 19S 33E	3,380	Seven Rivers	F. 254 B/D	6- 5-44	Discovery well of Skaggs-Deep field. First commercial oil production from Wolfcamp in West Texas.
*D-12	Fred Turner, State 1-B	Lea	4 17S 36E	5,175 PB 5,150	San Andres	F. 210 BO 5 hrs. 2' csg. out.	6-27-44	New Mexico district, Wolfcamp, Pennsylvanian, Devonian, Silurian, and Montoya, and Simpson sediments. Ellenburger not present.

* 1044 discoveries.

** Name not official at end of year.

the casing perforations. Good showings of oil and gas in the "Holt" zone (Glorieta-upper Yeso) also were obtained on drill-stem tests of the section from 5,130 feet to 5,250 feet and from 5,478 feet to 5,575 feet. Although no additional wells had been completed up to the close of the year, the Gulf's Gutman No. 1, north offset to the discovery well, was drilling below 4,600 feet, and The Texas Company had staked location for its Blinbry No. 1, a northeast diagonal offset. The Gulf's Andrews-State No. 1, $1\frac{1}{2}$ miles southeast of the discovery well, was drilling below 3,940 feet.

E-11—Skaggs-Deep.—On December 20, the New Mexico Federal Unit completed Skaggs B-23 No. 2, in Sec. 23, T. 20 S., R. 37 E., for a flowing potential of 269 barrels of 43° gravity oil per day through $\frac{3}{4}$ -inch tubing choke. This well

TABLE X
IMPORTANT DRILLING WELLS—SOUTHEASTERN NEW MEXICO
AT CLOSE OF 1944

No. on Map	Map Co- Ord.	Name of Well	County	Location			Drilling Depth (Feet)	Remarks
				Sec.	Twp.	Rge.		
1	D-13	Atlantic, J. E. Stevens 1	Lea	33	14S	33E	6,165	Midway between Vacuum and Caprock fields. Sulphur water in San Andres. Top of Glorieta 5,600 ft.
2	C-11	Cockburn, Wyatt 1	Lea	33	17S	33E	7,020	Deep test 1 mile SE. of E. end of Maljamar. Showing of oil in San Andres at 4,850 ft. Drilling in lower Yeso.
3	F-10	Gulf, Andrews-State 1	Lea	32	22S	38E	3,940	13 miles SE. extension Drinkard-Yeso field.
4	F-10	Humble, Frederal-Keinath 1	Lea	8	21S	38E	9,650	6 miles E. of production in Penrose and Hardy fields. Small oil showing in San Andres cores. Small showing of oil and salt water in Wichita at 7,500 ft. Stain in Devonian at 8,300-8,450 ft. Montoya and Simpson present. Top of Simpson 9,010 ft.
5	D-11	McElvain Bros., Seale 1	Lea	30	18S	34E	983	43 miles S. of W. end of Vacuum.
6	C-12	McLaughlin-Cosden, State 1	Lea	2	17S	32E	4,057	2 miles N. of Maljamar.
7	C-12	Phillips, Lea-Mex 4	Lea	17	17S	33E	8,250	Deep test 1 mile N. of E. end of Maljamar. Still drilling Permian at 8,250 ft. No showings.
8	E-9	Skelly, Steeler 2	Lea	17	23S	37E	3,433	Deep test 1 mile S. of production in Skelly area.
9	D-12	Texas Co., A. G. State 1	Lea	29	16S	34E	6,815	5 miles NW. Vacuum field. Oil showings in San Andres cores. Top Glorieta 5,000 ft.
10	F-12	Texas Co., Eaves 1	Lea	26	16S	38E	1,730	13 miles N. of Hobbs, 10 miles E. of Lovington field.
11	D-12	Vickers, State 1	Lea	2	16S	34E	3,990	8 miles N. of Vacuum field. San Andres test.

drilled into pre-Cambrian crystallines at 10,440 feet. Underlying the Abo (Wolf-camp) which was encountered at 7,700 feet, were sediments of Pennsylvanian, Devonian, Silurian, and Ordovician age. Montoya limestones and Simpson limestones, shales, and sandstones constituted the Ordovician formations drilled. No Ellenburger dolomite was found. Seven-inch casing was cemented on bottom and the well was completed in the Abo through casing perforations from 7,700 feet to 7,725 feet. This is the first commercial oil production from Abo sediments in the West Texas-southeastern New Mexico district. The "pay" is in porous white crystalline dolomite, interbedded with stringers of non-productive white crystalline fossiliferous limestone. At the close of the year, no additional wells had been started.

PRE-PERMIAN NEW DISCOVERY—SOUTHEASTERN NEW MEXICO

E-8—Dublin-Ellenburger.—The first pre-Permian strike in southeastern New Mexico was made when the Humble Oil and Refining Company completed Federal-Leonard No. 1, Sec. 12, T. 26 S., R. 37 E., for a flowing potential of 297 barrels of 50° gravity oil per day from Ellenburger (lower Ordovician) dolomite. This well is 2,500 feet lower structurally than the Ellenburger producers in the Keystone field, of Winkler County, Texas (*F-7, 8*), 10 miles southeast. Above the Ellenburger, which was encountered at 11,800 feet, strata of Simpson and Montoya (Ordovician), Silurian, Devonian, Mississippian, and Pennsylvanian age were drilled. The base of the Permian was reported at 8,130 feet. After cementing the 5½-inch casing at the total depth of 11,969 feet, 190 perforations were made in the interval from 11,895 feet to 11,933 feet. It was necessary to clean the perforations with 1,000 gallons of acid, after which the well flowed at the rate of 25 barrels of oil per hour.

TABLE XI
GEOPHYSICAL ACTIVITY, 1944

Type	In Jan.	In July	In Dec.
West Texas			
Seismograph	23	24	28
Gravimeter	15	12	12
Magnetometer	4	1	4
Core drill	1	2	2
Torsion balance	0	0	0
Electrical units	0	0	0
Total	43	39	46
New Mexico			
Seismograph	2	2	6
Gravimeter	3	2	4
Magnetometer	0	1	0
Core drill	1	1	1
Torsion balance	1	3	2
Electrical units	0	0	0
Total	7	9	13

TRENDS IN EXPLORATORY METHODS

The complexity of pre-Permian stratigraphy has resulted in a marked increase during 1944 in seismic exploration of the deeper beds. Regional mapping has continued to be done primarily by gravimeter and magnetometer, with the detail work being left to the seismograph. 1944 showed an increase of 9 in the total number of geophysical crews of all types active in the district. The most outstanding increase was in Lea County, New Mexico, where the number of seismograph parties increased from 2 in January to 6 in December. In West Texas, seismograph activity was greatest on the Central Basin platform, particularly in Andrews and Crane counties. With the exception of these counties, geophysical

exploration was evenly distributed over the entire district. Table XI shows fluctuations in activity during the year.

There has been closer integration of subsurface and geophysical exploration in 1944 than in former years. The seismograph has been used extensively in the delineation of individual structures along established and generally accepted subsurface trends.

The increase in deep exploratory and development drilling, with its consequent mud problems, has resulted in a generally accepted "intermediate" casing program. This, in turn, has greatly enhanced the value of electrical logging by preventing contamination of the drilling mud with salt. The trend is definitely toward the more extensive use of, and reliance on, electrical logging.

There has been much more core drill exploration than the statistics in Table XI indicate. This discrepancy is caused by frequent moving of the drills in and out of the area. Six units, in addition to those listed in the table, have been active in the district a large part of the time during 1944.

Several surface parties have been employed throughout the year in both the Edwards plateau and Big Bend provinces of the district.

DEVELOPMENTS IN NORTH AND WEST-CENTRAL TEXAS IN 1944¹

NORTH TEXAS GEOLOGICAL SOCIETY²
Wichita Falls, Texas

ABSTRACT

In 1944, the north and west-central Texas area contributed 75 discoveries or successful completions in new pay zones in areas already productive, and 29 extensions of proved fields. This is comparable with 52 new discoveries and 40 extensions in 1943. Included with the 1944 discoveries are 5 gas wells.

In 1944, 1,750 wells were drilled in the area. Of these, approximately 350 were wildcats. This is comparable with 1,483 wells drilled, including approximately 400 wildcats, in 1943, and indicates an 18 per cent increase in drilling activity for the year. The 1944 completions included 850 oil wells, 18 gas wells, and 882 dry holes.

Approximately 54,100,000 barrels of oil were produced in north and west-central Texas in 1944, as compared with 50,287,000 barrels in 1943. Wichita County again was the leading producer with 13,200,000 barrels during 1944, as compared with 14,575,000 barrels during 1943.

Probably the most important developments in the district in 1944 were: the extension of the thick Bend (or Caddo) conglomerate "pay" in the Hildreth pool of Montague County; the discovery of three Strawn sand pools in the Woodbine field of east-central Cooke County; the discovery of a new Strawn limestone pool underlying the shallower lower Cisco limestone pool in the Bateman field in King County; the discovery of a new Cisco sand pool northeast of Electra, Wichita County, Texas.

Five Ordovician dolomite or limestone discoveries were made in the area during 1944; a number of tests were drilled into or through this series.

Several additional Mississippian limestone discoveries during 1944 added appreciably to the reserves of the area. Some of these discoveries were under old producing pools; a few were in wildcat territory, although none indicated production over an appreciable area.

Of the 104 discoveries and extensions found in 1944, there were: 18 from shallow Cisco sands, 5 from Cisco limestones; 1 from a Canyon sand, 2 from Canyon limestones; 30 from Strawn sands, 3 from Strawn limestones; 32 from Bend limestones, conglomerates, and sands (including 28 from the "Caddo," and 4 from the Marble Falls); 8 from the Mississippian limestone; and 5 from the Ordovician limestone, dolomite, and sandy dolomite.

According to the available information, the discovery methods responsible for the new producing areas and extensions are as follows: 1 surface geology, 64 subsurface geology, 20 seismograph, 1 core drill, 6 drilling obligation, and 12 a combination of two or more methods. Seismograph and subsurface mapping continue to be the most effective methods of exploration in this district. At the end of the year there were 11 seismograph crews, 1 gravity-meter crew, 2 magnetometers, and 2 core drills working in the area.

Despite the fact the production for the area as a whole showed an increase during 1944 over 1943 and 1942, new reserves discovered are apparently less than half of the oil produced during the year.

INTRODUCTION

The north and west-central Texas districts include the area extending from the Llano uplift in central Texas, northward to the Red River and from the eastern rim of the Midland basin on the west side to include the Fort Worth syncline on the east side.

The major structural features of the area are the Bend arch, extending due northward from the Llano uplift into Wichita County, flanked on the east by the Fort Worth syncline, which, commencing at approximately the center of the

¹ Manuscript received, March 30, 1945.

² Data for this article received from John A. Kay, consulting geologist, Wichita Falls; Carl Wheeler, Pure Oil Company, Wichita Falls; T. F. Petty, Humble Oil and Refining Company, Wichita Falls; compiled and edited by W. L. Haseltine, Magnolia Petroleum Company, Box 239, Wichita Falls.

TABLE I
NEW POOLS AND EXTENSIONS DISCOVERED IN 1944

In- dex No.	County	Field	Operator	Farm and Well No.	Location	Class	Date	Producing Formation	Depth Top Prod. (Feet)	Total Depth Back (Feet)	Depth Placed Back (Feet)	Initial Production (Barrels)	Method of Exploration
1	Archer		H. Bolin	C. L. Abercrombie "B"	33, J. W. Harris Club Ranch S/D	New	5-20	Cisco sd.	1,485	1,501		P. 8	Sub.
2	Archer		F. E. Butler	Massie & Bridwell 2	W. H. Taylor 1	New	3-25	Cisco sd.	1,111	1,139		P. 10	Sub.
3	Archer	Garrett	John Carter	W. H. Taylor 1	J. Smith, 377	Ext.	11-6	Cisco sd.	1,607	1,611		P. 25 oil, 45 wtr.	Ran. dr.
4	Archer		Consolidated	Mrs. B. Garrett 1	John Walker, 676	New	6-12	Cisco sd.	3,780	5,085	3,820	Fl. 112	Sub.
5	Archer	Holiday	G. W. Cooper	Fred Daune 1	1, SPRR, 422	New	12-12	Strawn sd.	4,074	4,088		Fl. 110-4 hrs.	Sub.
6	Archer	Holiday	G. W. Cooper	J. R. Parkey, "Parkey Republic" 1	1, SPRR, 1233	New	6-27	Cisco sd.	1,573	4,370	1,580	P. 110	Sub.
7	Archer	Holiday	G. W. Cooper	W. H. Taylor 1	1, SPRR, 428	New	4-28	Strawn sd.	3,084	4,014		Fl. 121-4 hrs.	Sub.
8	Archer		A. P. Kouri	W. A. Keyes 1	6, Miller Dycus, S/D	New	10-22	Cisco sd.	1,114	1,110		P. 4 oil, 1 wtr.	Sub.
9	Archer	Ord	Maguire Ind.	W. R. Hammond 1	6, Miller Dycus, S/D	Ext.	9-8	Strawn sd.	4,173	5,591	4,185	P. 81	Sub.
10	Archer		Martin Prop.	John Purcell 1	6, H. Coraine, 56	New	9-8	Cisco sd.	1,150	1,154		P. 68 oil, 24 wtr.	Sub.
11	Archer		M. T. McLaugh- lin & H. R.	Roy King "Richard- son" 1	14, Thos. McCoy, 269	New	7-31	Cisco sd.	1,147	1,149		P. 43	Sub.
12	Archer	Luke	Phillips	L. F. Wilson "Cory" 1	100, ATNCL	New	5-8	Caddo ls.	4,860	5,724	4,878	Fl. 122-12 hrs.	Seis. & Sub.
13	Archer		Shaley	Abercrombie & Taylor 1	40, J. W. Harris S/D	New	10-12	Cisco sd.	1,399	1,404		P. 35	Sub.
14	Archer		White & Dillard	J. T. Richardson 1-C	10, Jonathan Scott,	New	10-28	Cisco sd.	1,214	1,220		P. 10	Sub.
1	Clay	Haleell	Bridwell Oil Co.	J. S. Bridwell 2	374, Word & Haleell's S/D, Brazos C.S.L.	New	5-10	Strawn sd.	4,745	4,770		Fl. 386	Sub.
2	Clay	Joy	L. T. Burns	C. L. Lumpkin 3	32, H. Williams, 704	Ext.	9-26	Strawn sd.	3,920	3,950		Fl. 42-3 hrs.	Sub.
3	Clay		Edge Oil Co.	W. D. Corckett 1	3245, TE&L	New	9-5	Ord. dol.	6,490	6,817	6,561	P. 107	Seis.
4	Clay	Ross	Continental, Sunder & Dillard	W. E. Williams 5	W. Walker, 703	New	5-20	Ord. dol.	5,600	6,145	5,670	Fl. 103-6 hrs.	Sub.
5	Clay	Petrolia	Dean Bros.	G. W. Byers & Co. 1	2, Byers Bros. S/D	New	8-20	Cisco sd.	820	826		P. 4	Sub.
6	Clay	West Ross	Fain-McGaha	O. O. Ross 1	7, BBB&C, 49	New	11-8	Caddo ls.	5,395	5,680	5,435	Fl. 137-4 hrs.	Seis. & Sub.
7	Clay	Spring (Ringold)	D. D. Feldman	H. D. Stine 1	25, 4, H&TC	Ext.	9-18	Caddo ls.	5,604	5,628		Fl. 138-3 hrs.	Sub.
8	Clay	Thorn	Lacy & Perry	M. M. Lyles 1	31, San Augustine Union, 403	New	5-23	Caddo ls.	5,860	6,236	5,870	P. 94	Sub.
9	Clay	Berry	Meredith Phillips	Geo. S. Myers 1	49, E. Storey, 419	New	12-2	Cisco sd.	1,153	1,155		P. 5 oil, 5 wtr.	Sub.
10	Clay			W. I. Howard "Vera" 1-A	44, T. J. Belcher S/D	New	12-13	Miss. ls.	5,803	6,035	5,821	P. 75	Seis. & Sub.
11	Clay	Joy	Shell	Mrs. E. J. Houston 1	11, H. Williams, 704	Ext.	7-23	Strawn sd.	4,004	4,047		P. 113	Sub.
12	Clay	Sealing	Continental & Wick	G. W. Sealing 1	J. Gamble, 168	New	4-10	Caddo ls.	5,554	6,100	5,570	Fl. 120-3 hrs.	Sub.
1	Coleman		Franchot-Ball, Hanson	Michie 1	J. L. Luckenbach, 258	Ext.	3-22	Bend ls.	3,313	3,325		P. 14	Sub.
2	Coleman	Williams	Hunter & Hun- ter & Sohio	Williams 1-B	18, 2, T&NO	New	3-7	Strawn sd.	3,768	3,876	3,799	Fl. 440	Sub.
3	Coleman	Novice	States Oil Corp.	Burroughs 1	3, HT&B	Ext.	12-8	Strawn sd.	2,820	2,840		Fl. 37	Sub.
4	Coke	Gatewood	S. D. Johnson	Betty Gatewood 1	MEPR, 706	New	10-8	Strawn sd.	1,508	1,581		P. 157	Sub.
5	Coke		B. D. Johnson	B. D. Johnson 1	19, B. D. Johnson	New	9-28	Strawn sd.	1,579	1,589		Fl. 100-3 hrs.	Magnetom- eter & Sub.
6	Coke	Woodbine	Kadane Griffith Oil Co.	S. B. Hopkins 1	17, BBB&C, 150	New	9-28	Strawn sd.	2,973	2,989		P. 224	Sub.
7	Coke	Woodbine	Ordnance	J. H. Bell 1	S. W. McKaeney	New	6-10	Strawn sd.	4,112	4,704	4,120	P. 224	Sub.
8	Coke	Woodbine	Ordnance	Foy Davis 1	G. De Los Santos	New	2-16	Strawn sd.	4,340	4,357		Fl. 110	Sub.
9	Coke	Woodbine	Ordnance	J. W. Wilson 2	R. J. Wilson, 1141	New	6-10	Strawn sd.	4,512	4,515		P. 235	Sub.
10	Coke	Woodbine	Ordnance	A. D. Walterscheid 1	Eleanor Langford, 566	New	8-19	Strawn sd.	2,600	2,610		P. & Fl. 62-6 hrs.	Sub.

TABLE I—Continued

In- dex No.	County	Field	Operator	Farm and Well No.	Location	Class	Date	Producing Formation	Depth Top Prod. Form. (Feet)	Total Depth Paced Back (Feet)	Initial Production (Barrels)	Method of Exploration	
8	Cooke	Walnut Bend "Mont- gomery"	Sinclair	Winnie Montgomery 1	Robt. Finley, 389	New	2-1	Strawn sd.	5,112	5,137	Fl. 152-3 hrs.	Seis.	
9	Cooke		Texas	Gainesville Nat'l Bank 1	T. W. Ward, 1089	New	12-11	Ord. dol.	5,409	5,727	5,485	Fl. 220-16 hrs.	Seis. & Sub.
10	Cooke		Texas	W. B. Reasure 1	J. Massingill, 687	New	12-1	Strawn sd.	6,756	7,518	6,780	P. 139	Seis.
1	Fisher		Northern	Mary E. Howard 1-B	H&TC, 180	New	7-5	Strawn ls.	5,585	5,609	Fl. 125-5 hrs.	Seis.	
1	Hardeman	Chillicothe	Ordnance	O. H. Dodson 1	49, 10 H&TC	New	5-16	Strawn ls.	4,245	7,301	4,255	P. 10	Seis.
1	Jack		Humble	Wm. L. Risch 1	C.S.L. Henderson	New	11-25	Strawn sd.	4,386	6,415	4,400	Fl. 40-3 hrs.	Seis.
2	Jack	Ellis	Continental	Ellis & Dubose "F" 1	4, J. W. Williams, 877	Ext.	5-7	Caddo ls.	4,696	4,723	Fl. 84-3 hrs.	Seis.	
3	Jack	Matlock	Buchanan	C. E. Matlock 1	A. H. Latimer, 363	New	10-24	Miss. ls.	5,311	5,344	Fl. 68-6 hrs.	Mag. & Seis.	
4	Jack		Buchanan	J. W. Kinder 1	2667, TE&L	Ext.	2-9	Canyon sd.	1,850	2,270	1,858	Fl. 25	Sub.
5	Jack		Panhandle	G. A. Biggers 1	Blankenship, 1447	New	6-9	Strawn sd.	2,274	3,077	2,314	3 1/2 M.C.F.	Trend
6	Jack	Ellis	C. F. Peffley	Bryant 1	W. Berryman, 40	Ext.	9-30	Caddo ls.	4,062	5,026	P. 6	Trend	
7	Jack	Ellis	O. J. Perrin	O. J. King 1	J. S. Henderson, 1619	Ext.	9-30	Caddo ls.	4,718	4,928	4,727	Fl. 600-1 1/2 hrs.	Seis.
8	Jack	Lester	Shell	O. J. Lester "A" 1	McKinney-Williams,	New	3-6	Miss. ls.	5,444	5,510	5,444	Fl. 100-1 1/2 hrs.	Seis.
9	Jack	Lester	Shell	O. J. Lester "B" 1	McKinney-Williams,	New	5-25	Caddo ls.	4,968	5,744	4,980	Fl. 83-8 hrs.	Seis.
10	Jack		Std. of Texas	L. N. Wolfe 2	G. S. Newman, 1148	New	3-29	Bend ls.	4,828	4,864	9 M.C.F.	Seis.	
11	Jack	Peck	Std. of Texas	F. C. Bloodworth 1	3316, TE&L	Ext.	10-14	Caddo ls.	4,668	4,800	4,683	Fl. 142-6 hrs.	Seis.
1	Jones		Buchanan	J. M. Alexander 1	3, 14, T&P	New	3-19	Cisco sd.	1,647	1,658	1,655	P. 126	Sub.
2	Jones		Eason Oil Co.	Freeman 1	263, Henry Virm	New	3-7	Cisco ls.	2,788	2,815	2,793	P. 15	Sub.
3	Jones		Jones & Stacey	W. D. Hawthorne 3	J. W. McKissick, 204	New	2-22	Cisco ls.	2,533	2,722	2,540	P. 10 oil,	Core drill
4	Jones	Weaver	Merry Bros.	Ida L. Weaver 1	6, 17, T&P	New	7-8	Cisco sd.	2,463	2,474	2,407	50 wtr.	Sub.
5	Jones	Wimberly	W. J. Alder	E. L. Kelso 1	25, 17, T&P	Ext.	5-13	Cisco ls.	2,563	2,570	2,566	P. 86-7 hrs.	Sub.
1	King	Bateman	Mining	E. W. Bateman, Jr. 4	101, John B. Rector	New	8-6	Strawn ls.	5,333	6,388	5,373	P. 121	Surf.
1	Montague	Mallard	Continental	J. M. Hundley 1	D. Martindale, 465	New	7-31	Caddo cgl.	6,228	8,018	6,235	Fl. 251-6 hrs.	Seis.
2	Montague	McNutt	Continental	J. K. McNutt 1	ETFR, 1069	New	10-31	Ord. ls.	6,715	7,299	6,950	Fl. 33-3 hrs.	Seis.
3	Montague	Rogers	S. A. Dardman,	J. J. Berry Est. et al. 1	W. J. Wells, 844	Ext.	11-29	Caddo cgl.	5,330	5,351	5,351	Fl. 182-6 hrs.	Promotion & Sub.
4	Montague	Dodson	Maguire Ind.	Gould Whaley 1	16, BB&C, 84	Ext.	5-17	Caddo cgl.	5,147	5,200	Fl. 265-3 hrs.	Lease Ob- ligation	
5	Montague	Hildreth	C. H. Murdick	Ida Pearl Matney 1	W. E. Davis, 210	Ext.	6-11	Caddo cgl.	6,000	6,230	Fl. 656-4 hrs.	Lease Ob- ligation	
6	Montague	Hildreth	C. H. Murdick	Ida J. Walshall "A" 1	S. H. Smith	Ext.	7-29	Caddo cgl.	6,114	6,332	6,141	Fl. 126-3 hrs.	Sub.
7	Montague	Bowers	Pace Pet. Co.	Mattie L. Jones 1	H. H. Grimes, 288	New	2-27	Strawn sd.	2,405	2,415	P. 60	Sub.	
8	Montague		Sinclair	W. M. Templeton 1	Edw. Wingo, 836	New	6-16	Caddo cgl.	6,050	6,330	6,117	P. 104 oil,	Seis.
9	Montague		Texas	L. L. Cobb 1	C. A. Burnes, 48	New	1-23	Strawn sd.	2,448	3,304	2,451	P. 42	Sub.
10	Montague	Nocona	Fortex Oil	I. A. Gist "B" 15	Wm. Donoho, 178	Ext.	10-13	Cisco sd.	5,811	8,621	5,858	Fl. 47 oil, 1 wtr.	Sub.
1	Shackel- ford		Corp.	Smalley 2	13, 10, ET	New	11-1	Cisco sd.	621	635	631	P. 12	Sub.
1	Stephens		Northern	Robertson 1	1142, TE&L	New	6-18	Bend ls.	3,222	3,226	Fl. 101	Sub.	
2	Stephens		Phillips	Wild 1	48, BAL	New	3-10	Ord. ls.	4,362	4,415	4,375	Fl. 692	Seis.
3	Stephens		Phillips	O. E. Allen 1	T. Watson	New	5-16	Caddo ls.	3,222	3,222	P. 13 oil, 8 1/2 wtr.	Seis.	
4	Stephens		Sinclair	A. Atkins 16-A	19, 2, SPRR	New	8-18	Miss. ls.	4,245	4,395	4,200	Fl. 1,545	Sub.

TABLE I—Continued

In- dex No.	County	Field	Operator	Farm and Well No.	Location	Class	Date	Producing Formation	Depth Top Prod. Feet	Total Depth Feet	Depth Plugged Back Feet	Initial Production (Barrels)	Method of Exploration
5	Stephens		Woodley	G. W. Thorpe 1-B	456, SPRR	New	12-15	Miss. ls.	3,745	3,900	3,820	FL 45 oil, 20 wt.	Sub.
1	Taylor		Great Lakes Carbon Texas	Jones 1	43, Wm. Bishop	New	11-6	Cisco ls.	2,005	2,034	2,010	P. 50	Sub.
2	Taylor			Henry Sayles 1-C	Sayles S/D W. R. Hill Leauge—122, 2, Jas. Bell, 1381	New	10-31	Cisco ls.	2,268	2,284		P. 31	Sub.
1	Throck- morton		Griham- Hunter	Kelley 2-D	2170, TE&L	New	3-12	Cisco sd.	811	819		P. 128	Sub.
2	Throck- morton		Panhandle	W. B. Ewalt 1	289, Waggoner Colony Lds. BS&F, 378	New	9-15	Bend ls.	4,156	5,034	4,161	FL 120-3 hrs.	Seis.
1	Wichita	Krohn	Akin & Dimock	P. G. Krohn 3	289, Waggoner Colony Lds. BS&F, 378	New	6-12	Cisco sd.	1,600	1,697		FL 65	Sub.
1	Wichita	KMA	Auto-Ordance & H. C. Byrne Consolidated	Will Burnett 1	5, Cherokee	Ext.	4-1	Straun sd.	4,005	4,044	4,037	P. 75	Sub.
3	Wichita	Airport		A. Laukauf 3	C.S.L., 30	New	5-5	Straun sd.	3,822	5,481	3,900	P. 15	Sub.
4	Wichita	West	Continental	F. C. Hunt 1	J. Dillon, 353	Ext.	11-13	Straun sd.	4,223	4,336		P. 145	Seis.
5	Wichita	Davidson	Fain-McGaha	C. R. Krizan 1	43, Cherokee	Ext.	4-5	Straun sd.	4,808	5,535	4,851	FL 112-8 hrs.	Sub.
6	Wichita	Madden	Panhandle	E. B. Madden 1	8, A. Kemp S/D	New	6-2	Straun sd.	4,270	5,350	4,300	P. 31	Seis.
7	Wichita	KMA	Panhandle	E. B. Madden 3	8, Wm. Mayer, 193	New	11-20	Bend ls.	5,072	5,131		FL 1,440	Seis.
8	Wichita	KMA	Panhandle	R. H. King 1	7, Palo Pinto	Ext.	3-24	Straun sd.	4,064	4,937	4,004	P. 18	Seis.
9	Wichita	KMA	Texas	Fred Thom 15	S. H. Spillers, 257	New	12-1	Cisco sd.	1,793	1,805		P. 92-12 hrs.	Sub.
1	Wilbarger	Odell	Fain-McGaha	C. K. Martin 1	5, 11, H&TC	New	10-16	Canyon ls.	4,699	4,841	4,806	FL 105-10 hrs.	Seis. & Sub.
2	Wilbarger	Harrold	T. Leo Moore	Sam Kelly 1	34, 13, H&TC	Ext.	9-21	Canyon ls.	3,242	3,297	3,260	P. 30	Drilling Oligation Sub.
1	Young		A. G. Bedner	Finley 1	6, Poltevent-Everett, 2074	New	2-20	Bend ls.	3,940	4,113	4,050	FL 35	Sub.
2	Young		Belfort	Mrs. S. A. Clark, "Brader-Clark B"	1, EL&RR, 1307	Ext.	8-1	Straun sd.	3,817	3,850		FL & P. 15	Sub.
3	Young	Zweifel	Bridwell	J. S. Bridwell & Mrs. J. Mayfield 1	A. Bryant, 1950	Ext.	5-11	Bend ls.	3,978	4,032		FL 42-3 hrs.	Sub.
4	Young		Burk Royalty	E. C. Stovall 1	495, TE&L	New	7-1	Marble Falls	4,352	4,563		FL 148-10 hrs.	Sub.
5	Young		L. T. Burns	N. Brooks 1	299, TE&L	Ext.	8-18	Miss. ls.	4,931	4,952		FL 170 (40% wtr.)-4 hrs.	Seis.
6	Young	Burns, Ragland Sewell	L. T. Burns	Marie L. Christian 1	256, 255, TE&L	New	5-15	Straun sd.	2,584	4,075	2,592	FL 150	Seis. & Sub.
7	Young		Thos. D. F. D. Grey	M. K. Graham 1	G. W. Robinson, 1820	Ext.	4-10	Bend ls.	3,995	4,160	4,003	FL 288-71 hrs.	Sub.
8	Young	Sewell	Thos. D. Humphrey	W. L. McCloud 1	BS&F, 2211	Ext.	11-20	Miss. ls.	4,456	4,722	4,463	7 M.C.F.	Sub.
9	Young		Kerlyn & Phillips	W. H. Clarida 1	W. A. Nicholson, 1691	New	7-17	Miss. ls.	5,263	5,010	5,270	FL 204-6 hrs. (15% wtr.)	Seis. & Sub.
10	Young	Cope	Kerlyn & Phillips	W. W. Cope 1	1475, TE&L	New	4-10	Caddo ls.	4,385	4,437	4,428	FL 154-6 hrs.	Sub.
11	Young		M. E. McBrayer 1		1997, TE&L	New	6-10	Caddo ls.	4,334	5,413	4,350	P. 21 oil, 6 wt.	Sub.
12	Young		H. L. Robertson 2		F. L. Green, 105	New	7-5	Caddo ls.	4,175	4,270	4,180	P. 155 oil, 116 wtr.	Sub.
13	Young		Ordinance Panhandle & Rankin	B. F. Scott 1	J. G. Garrett, 108	Ext.	3-7	Straun sd.	3,119	4,375	3,150	3/4 M.C.F.	Sub.
14	Young	Padgett	Shell	S. L. Scott "B" 1	334, TE&L	Ext.	1-20	Caddo ls.	4,132	5,472	4,208	P. 71 oil, 10 wt.	Seis. & Sub.
15	Young		Std. of Ohio	J. R. Garvey 1	1866, TE&L	New	7-27	Caddo ls.	4,463	4,480	4,474	FL 168-3 hrs.	Sub.

Under "Location", arranged in order as follows: Lot number, Section number, Block number, Survey name, Abstract number.

Under "Class": New, pool, Ext., extension.

Under "Initial Production": P., pumped; FL, flowed; M.C.F., million cubic feet of gas per day. Production figures for 24-hour day unless otherwise indicated.

Under "Method of Exploration": Mag., magnetometer; Ran. dr., no geologic or geophysical information; Seis., seismograph; Sub., subsurface; Surf., surface geology.

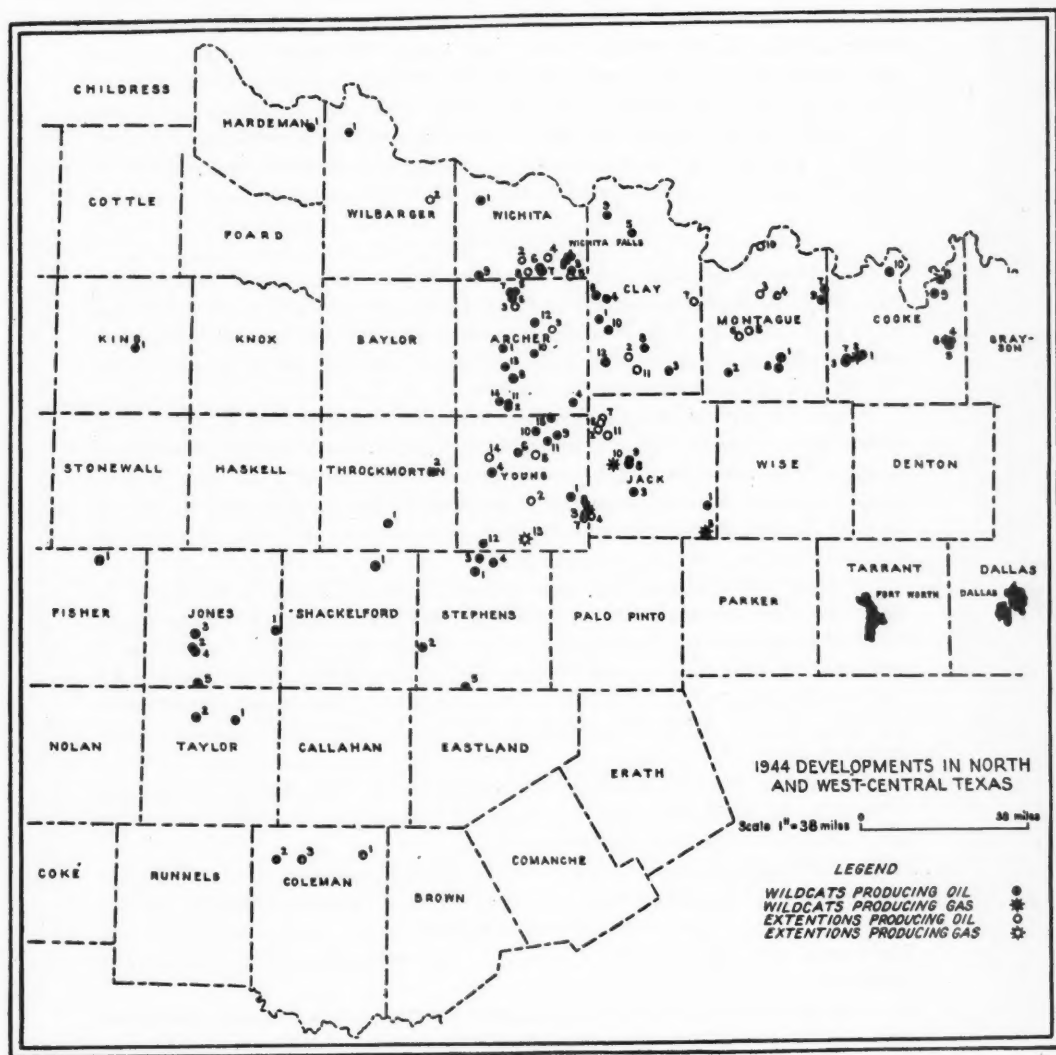


FIG. 1

west line of Clay County, extends in depth southeastward through Clay County, across southern Montague County, through northeast Wise County, and across central Denton County. The Electra arch extends from northern Clay County westward across north Wichita County and central Wilbarger and Foard counties. The Muenster arch extends through the southeast corner of Cooke County diagonally across that county northwest and through northeast Montague County. The Red River syncline parallels the Electra arch on the north and increases in depth westward as it enters Wilbarger County and continues to deepen westward through north Hardeman County.

DEVELOPMENT

Development in north and west-central Texas in 1944 showed a marked increase over the previous year, with a total of 1,750 wells drilled, as compared with 1,483 wells drilled in 1943. There were approximately 350 wildcats drilled in 1944, as compared with 400 wildcats drilled in 1943. The 1944 completions included 850 oil wells, 18 gas wells, and 882 dry holes.

Approximately 54,100,000 barrels of oil were produced in north and west-central Texas in 1944. This is comparable with 50,287,000 barrels of oil produced in 1943. Approximately 24 per cent of the production in north and west-central Texas in 1944, or 13,200,000 barrels, came from Wichita County wells. However, Wichita County wells produced more than 29 per cent of the total production in the district in 1943, or 14,575,000 barrels.

Although production for the area as a whole showed a 7 per cent increase in 1944 over 1943, certain fields declined somewhat; for instance, production from the KMA field (largest in the area) was approximately 1,200,000 barrels less in 1944 than in 1943. Part of this decline was from the KMA Strawn sand which produced 590,000 barrels less in 1944 than in 1943, or at the rate of approximately 7 per cent less; the KMA Ellenburger production decreased by 613,000 barrels, or 21 per cent less than in 1943.

The new fields, new producing formations in old fields, and extensions discovered in the district in 1944 are indicated in Figure 1 and in Table I. They may be evaluated in importance as follows.

1. The extension of the thick Bend (or Caddo)³ conglomerate "pay" in the Hildreth field of Montague County, Texas. There were 9 producing wells at the beginning of 1944, whereas at the end of the year there were 80 producing wells in the field. The field has been delimited by dry holes on the southwest, east, and northeast.

2. A new Strawn field in eastern Cooke County, which has been designated the Woodbine field, was discovered in February, 1944. At the end of the year there were 18 producing wells in the field, 6 each from 3 sand pools. The field has been delimited by dry holes on all sides.

³ The Caddo is a drillers' term and includes several different formations of Lower Pennsylvanian age.

3. In August, 1944, a new Strawn limestone pool underlying the 3,700-foot lower Cisco limestone "Bateman" pool of east-central King County, was discovered. The "Bateman" Strawn limestone (which has been correlated by some with the KMA Strawn production in Wichita and Archer counties) has added appreciably to the reserves of the area. At the end of the year there were 4 producing wells and 2 drilling wells in the "Bateman" Strawn pool.

4. A few miles northeast of Electra, and only a short distance north of the older producing areas, a new Cisco sand pool was opened in June, 1944, with the third test in an area since designated as the Krohn pool. At the end of the year there were 12 producing wells from the 1,680-foot Cisco sand in the pool. The pool has been delimited on the north, east, and south by dry holes.

5. A Cisco limestone outpost in the vicinity of the Wimberly pool, Jones County, extended production in the area over several hundred more acres, thus indicating this field to be the best producing area in the county.

6. Seven Mississippian limestone pools were discovered or extended in north and west-central Texas during the year. Most of these pools indicated small but highly prolific areas of production. They have been tentatively classified in their order of importance, as the Lester and Matlock pools in Jack County; the Atkins area in Stephens County; the Brooks, McCloud, and Clarida leases in Young County; and the Howard "Vera" lease in Clay County.

7. Rapid development in the Vogtsberger pool in northern Archer County added appreciably to the production in this area. On January 1, 1944, there were 10 producing wells in the pool, while at the close of the year there were 24 producing wells. This production is largely from lenticular Strawn sands.

8. A Caddo pool discovered in 1943 was extended and developed further in 1944 in the Luke area of north-central Archer County. Production rose rapidly with the completion of approximately 10 wells in the area during the year, making a total for the pool 16 wells.

9. The rapid development of the producing areas in northwest Jack County extended production over a fairly large area in the Ellis, Peek, and McDonald pools. At the end of the year there were approximately 45 producing wells in these pools, as compared to 15 at the beginning of 1944.

10. A new producing area in Coleman County was discovered in March, 1944, which indicated a fairly large Cisco sand pool. At the end of the year there were 10 producing wells in the area which has been designated the Williams pool.

11. Orderly development during 1944 in the West pool, almost within the city limits of Wichita Falls, indicated this KMA Strawn sand production to be of importance. At the end of the year there were 16 producing wells in the pool.

12. A new shallow pool in Throckmorton County was discovered in March, 1944, which indicated flush production from a Cisco sand above 1,000 feet. Although the proved area is small, this pool clearly indicates the importance of prospecting for shallow oil in the older producing county units of the district.

13. Three relatively shallow Strawn sand pools were indicated by discoveries

in southwestern Cooke County on the Gatewood, Hopkins, and Walterscheid leases. At the end of the year production in these areas was small, and the pools appeared to be quite limited for future possibilities.

14. Production from lenticular Strawn sands probably affected by faulting, was discovered in the Walnut Bend "Montgomery" pool in February, 1944. At the end of the year there were 5 producing wells and 5 dry holes in the area.

15. Near Sivells Bend in extreme northern Cooke County, a small Strawn sand producing area was indicated by the completion of a 7,500-foot test in a sand from 6,756-6,780 feet. From the subsurface information available at the end of the year, this area will probably be of little commercial importance.

16. The Ordovician developments in 1944 were marked by the discovery of a new Ellenberger dolomite and limestone producing zone near the old Ibex pool, at the extreme western edge of Stephens County, in March, 1944. This pool, which has been designated as the "Wild," had 4 producing wells at the end of the year. Of importance was the first commercial oil produced from the Ordovician dolomite in the Ross pool in northwestern Clay County, in May, 1944. It is probable, however, that the Ordovician production in the Ross pool will be limited due to rapid variation in porosity and the proximity of water to the pay. A new Ordovician dolomite pool was discovered near the community of Buffalo Springs in southeastern Clay County upon the successful completion of a wildcat on the Crockett lease. There had been no additional developments in the vicinity of the "Crockett" Ordovician pool at the end of 1944.

17. Probably the most interesting of the Ordovician discoveries in 1944 was the successful completion of a wildcat well on the McNutt lease (in southwestern Montague County) from a porous limestone which has been identified as correlative with the Viola of Oklahoma. The "McNutt" pool had no additional development at the end of the year.

18. Caddo limestone possibilities were extended some miles northwestward by the discovery of a porous productive zone from 4,156-4,161 feet in a wildcat well in northern Throckmorton County. This pool has been designated as the Ewalt, but at the end of the year there had been no additional production in the area from the Caddo.

Of the 104 discoveries and extensions found in north and west-central Texas in 1944, there were 18 from shallow Cisco sands, 5 from Cisco limestones; 1 from a Canyon sand, 2 from Canyon limestones; 30 from Strawn sands, 3 from Strawn limestones; 32 from Bend limestones, conglomerates, and sands (including 28 from the "Caddo," and 4 from the Marble Falls); 8 from Mississippian limestones; and 5 from the Ordovician. The Ordovician discoveries included production from limestone, dolomite, and sandy dolomite.

A tabulation of the more important dry wildcats of the area has not been attempted in this report, although there were numerous dry tests which added appreciably to the subsurface geological information of the district.

The discovery methods responsible for the new producing areas and exten-

sions are as follows: 1 surface geology, 64 subsurface geology, 20 seismograph, 1 core drill, 6 drilling obligations, or random drilling on no definite geologic or geophysical information, and 12 a combination of two or more methods. Seismograph and subsurface mapping continue to be the most effective methods of exploration in this district. At the end of the year there were 11 seismograph crews, 1 gravity-meter crew, 2 magnetometers, and 2 core drills working in the area.

The trend in exploration and development in the district in 1944 was in the older producing areas (or county units) as evidenced by the 15 discoveries and extensions in Young County, 14 in Archer County, 12 in Clay County, 11 in Jack County, 10 each in Cooke and Montague counties, 9 in Wichita County, 5 each in Stephens and Jones counties, 3 in Coleman County, 2 each in Taylor, Throckmorton, and Wilbarger counties, 1 each in Hardeman, Fisher, King, and Shackelford counties. The discovery of the Strawn limestone oil in King County greatly stimulated exploration in the western counties of the district.

New reserves discovered in 1944 can not be estimated accurately at this time, but are apparently less than half the oil produced during the year.

DEVELOPMENTS IN EAST TEXAS IN 1944¹

EAST TEXAS GEOLOGICAL SOCIETY²

Tyler, Texas

ABSTRACT

Nine new oil-producing areas and one oil- and gas-producing area were discovered in East Texas during 1944. One of the new oil areas produces from the Nacatoch formation; one from the sub-Clarks-ville zone of the Eagle Ford formation; one from both the Paluxy formation and the Rodessa zone of the lower Glen Rose formation; three others from the Rodessa zone of the lower Glen Rose formation; one from the James limestone (?), a member of the lower Glen Rose formation; and two from the Travis Peak formation. The Eylau field, which produces both oil and gas, provided the first Smack-over limestone production for Texas.

Six new producing zones were discovered in older fields. One of the new zones produces only gas: two produce oil and gas: and three produce oil.

The trend toward deeper exploratory drilling continued during 1944, with most of the important tests having the lower Glen Rose, Travis Peak, Cotton Valley, and Smackover formations as their objectives.

INTRODUCTION

The East Texas district is essentially the East Texas basin, and extends from the Fort Worth basin on the west, to the Louisiana state line on the east. North and south it extends from the Oklahoma state line to include Robertson and Angelina counties, where it joins the upper Gulf Coast district.

As shown in Table I, the East Texas district had a slight increase in drilling activity in 1944 over 1943. There was a small increase in gas wells completed, a small decrease in oil wells completed. However, the year 1944 provided 9 oil discoveries, together with one oil and gas discovery, as compared with 4 oil discoveries and 2 gas discoveries in 1943.

TABLE I
COMPARISON OF DRILLING ACTIVITY

	1943	1944	1944	
			Increase	Decrease
Total wells	299	317	18	
Field wells	189	199	10	
Oil wells	131	120		11
Gas wells	22	40	18	
Dry holes	36	39	3	
Wildcat wells	110	118	8	
Oil wells	4	9	5	
Gas wells	2	0		2
Dry holes	104	109	5	

DISCOVERIES, EXTENSIONS, AND NEW PRODUCING ZONES

All of the 1944 discoveries (Table II), with four exceptions, were in beds of lower Glen Rose and Travis Peak age. These four exceptions were Calvert,

¹ Manuscript received, April 7, 1945.

² Data furnished by the members of the East Texas Geological Society and compiled by H. C. Matheny and Lynn L. Harden, Sinclair Prairie Oil Company.

OIL & GAS FIELDS OF EAST TEXAS 1944

NEW FIELDS (1944) OLD FIELDS
LOCATION OF IMPORTANT EXPLORATORY TEST

GENERALIZED GEOLOGIC SECTION
EAST TEXAS

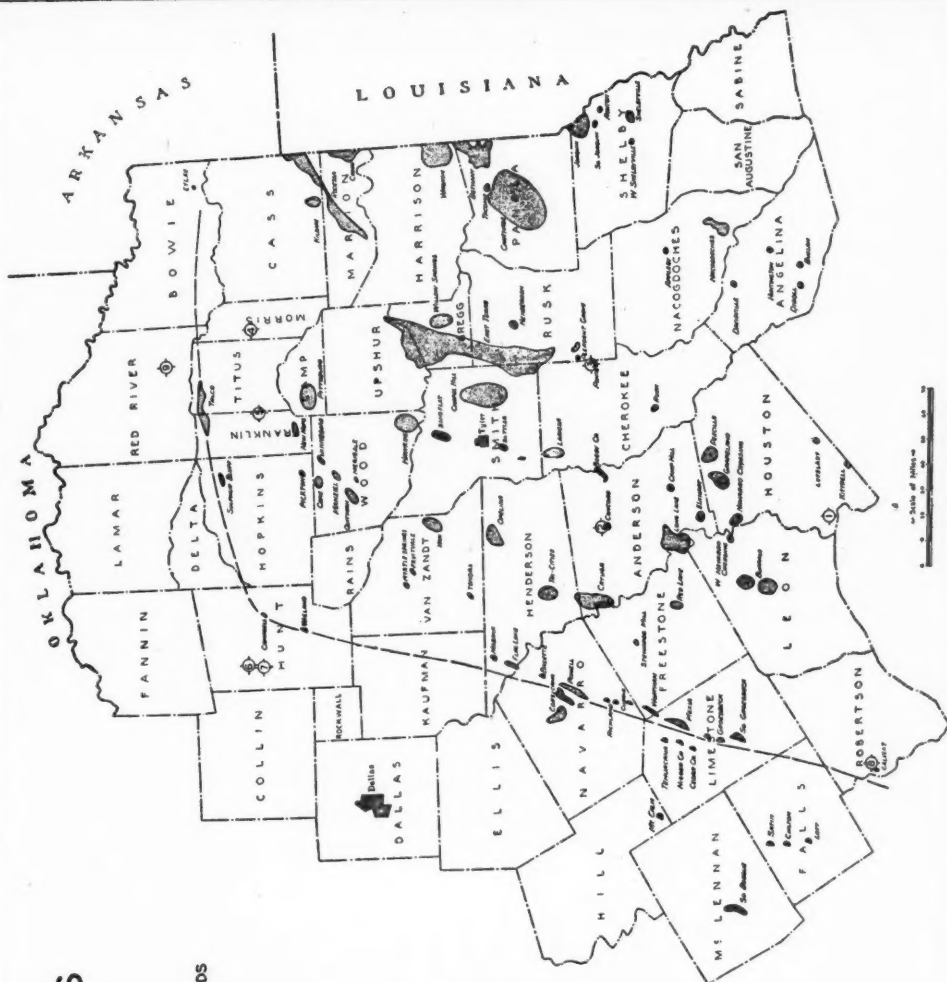
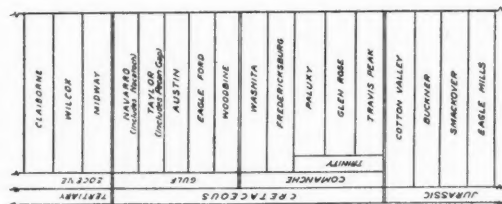


FIG. 1

TABLE II
DISCOVERIES AND EXTENSIONS IN 1944

County	Field	Operator	Farm and Well No.	Location	Class	Date	Producing Formation	Pay Interval (Feet)	Initial Production	Discovery Method
Bowie	Eylau	Barnsdall	Helbron 2	6 mi. SW of Texarkana	New	8-15-44	Smackover	7,687-7,689	F 155 oil	Seis.
Cass	Rodessa	Skelly	Baldwin 1	J. Taylor Sur., 6 mi. SE Kildare	Ext.	4-20-44	Glen Rose (lower) (Rodessa-Henderson sd.)	5,850-5,865	1400 MCF	Seis.
Franklin	New Hope	Tide Water-Seaboard	Elledge 1	I. Barre Sur., 1/2 mi. NE Winnaboro	N. fm.	3-15-44	Glen Rose (lower) (Rodessa-Hill sd.)	7,433-7,446	F 412 oil	Sub.
Franklin	New Hope	Tide Water-Seaboard	Campbell 1	Maxwell Sur., 2 mi. NE Winnaboro	N. fm.	2-21-44	Glen Rose (lower) (Elledge)	8,156-8,190	F 205 oil	Sub.
Hopkins	Pickton	Humble	Nichols 1	2 mi. S Pickton	New	11-9-44	Glen Rose (lower) (Rodessa limestone)	7,866-7,896	F 620 oil	Sub.
Limestone	Groesbeck	Zephyr	Nussbaum 1	S. H. Bates Sur., 3 mi. NW Groesbeck	N. fm.	4-17-44	Glen Rose (upper)	4,738-4,746	P 30 oil	Sub.
Marion	Jefferson-Lodi	Ark-La Gas	Walker 1	J. Humphries Sur., 1/2 mi. NE Jefferson	N. fm.	4-17-44	Travis Peak	4,776-4,786	24 wtr	Sub.
Panola	Carthage	R. Lacy	Cameron Lbr. 1	W. M. N. Carthage Sur., 6 mi. N Carthage	N. fm.	6-15-44	Travis Peak	7,010-7,024	15,000 MCF	Sub.
Robertson	Calvert Sand Flat	Hammon Expl.	Gibson 1	5 mi. SW Calvert	New	7-6-44	Nacatoch	6,230-6,240	F 26 oil	Sub.
Smith	Sand Flat	Skelly	Chism et al. 1	6 mi. N Tyler	New	3-17-44	Paluxy	2,184-2,194	P 55 oil	Core drill and Seis.
Smith	South Tyler	Sun	Patterson 1	F. Flores Sur., 6 mi. S Tyler	N. fm.	5-31-44	Glen Rose (lower)	6,072-7,015	F 153 oil	Sub.
Smith	South Tyler	Phillips Pet.	McMinn 1	5 mi. S Tyler	New	7-28-44	Glen Rose (lower) (James' limestone)	9,336-9,364	P 24 oil	Surf. Sub. Core drill Seis.
Van Zandt	Fruitvale	Superior Oil of Calif.	Groves 1	4 mi. NE Canton	New	3-20-44	Travis Peak	8,552-8,570	P 70 oil	Seis.
Van Zandt	Myrtle Spgs. Cartwright	Humble	Bruce 1	5 mi. NW Canton	New	12-22-44	Travis Peak	8,524-8,540	P 87 oil	Seis.
Wood	Cartwright	Shell	Whitley 1	Jno. Folk Sur., 5 mi. NE Quitman	N. fm.	7-6-44	Glen Rose (lower) (Rodessa-Young zone)	8,455-8,595	P 40 oil	Sub.
Wood	Cartwright	Amerada-Shell	Hague 1	5 mi. NE Quitman	N. fm.	9-13-44	Glen Rose (lower) (Pettit)	8,748-8,773	F 84 oil	Sub.
Wood	Merigale	Mandel	Evans 1	5 mi. NE Canton	New	12-17-44	Sub-Clarksville	4,860-4,095	P 32 oil	Seis. Sub.
Wood	Winnaboro	Gulf	Brewer 1	2 mi. SW Winnaboro	New	3-25-44	Glen Rose (lower) (Rodessa, Gloyd ls.)	4,014-4,044* 7,990-8,014 8,264-8,288	F 320 oil	Surf., Sub., Seis.

* Entire perforated interval consists of shale with thin sand laminae, probable total of 25 feet of sand.

Under "Class": New, new pool; Ext., extension; N. fm., new producing formation or zone.
Under "Initial Production": P, pumped; F, flowed; MCF, thousand cubic feet gas per day; oil, barrels per day. Production figures for 24-hour day unless otherwise indicated.
Under "Discovery Method": Surf., surface geology; Seis., seismicograph; Sub., subsurface.

Robertson County, in the Nacatoch; Merigale, Wood County, in the sub-Clarks-ville; Sand Flat, Smith County, in the Paluxy; and Eylau, Bowie County, in the Smackover limestone. The four most promising discoveries are discussed.

EYLAU FIELD

The 1944 Jurassic exploration in East Texas resulted in only one discovery, Smackover limestone production in the Eylau field in southeastern Bowie County. The first test drilled in this field was the Barnsdall Oil Company's Heilbron No. 1, in the M. H. Janes Survey, which found the top of Smackover limestone at 7,704 feet, and was drilled to the total depth of 7,836 feet, a penetration of 132 feet. Showings of oil and gas were found in cores in the top part of the Smackover limestone in this well and casing was run to test. Production tests through casing perforations, however, resulted only in very small amounts of oil and slight showings of gas with considerable salt water, and the well was abandoned. The same company's Heilbron test No. 2 was drilled 820 feet west and slightly north of the Heilbron No. 1 dry hole. This well No. 2 was originally drilled to the total depth of 7,701 feet in the Smackover limestone, and 5½-inch casing was set at 7,700 feet. Many production tests were made through casing perforations and the well was finally drilled deeper to 7,716 feet and 4½-inch liner was run to this total depth. After considerable additional testing, the well was finally completed through casing perforations from 7,710 to 7,714 feet, for an initial production of 78.5 barrels of 38.9° gravity oil per day, with a high gas-oil ratio. Considerable difficulty was later encountered in this well with salt production, the salt occurring as rock salt crystals which plugged the tubing. Re-working of the well has been necessary to keep it on production. The gas-oil ratio increased rather rapidly in this well and it appears likely that in this field a thin oil zone is overlain by a comparatively thick gas cap. The third test drilled was the Barnsdall and Sohio's Gifford-Hill No. 1, which is located 900 feet west of the Heilbron No. 2 producer. The Gifford-Hill test No. 1 encountered a Buckner-igneous contact with no development of Smackover limestone. The igneous material was topped at approximately 7,694 feet and was penetrated 141 feet. Structurally, on the top of the Buckner formation, the Gifford-Hill No. 1 is practically flat with the Heilbron No. 2 producer, and the Heilbron No. 2 is 50 feet higher than the Heilbron No. 1 dry hole.

There has been considerable speculation as to the structural conditions in this field and the relationship between structure, limestone development, and oil and gas accumulation. At this time the size of the producing area is entirely unknown.

This field was located after extensive geophysical work and was rechecked with seismograph after the No. 1 dry hole was completed.

PICKTON FIELD

The Pickton field, of Hopkins County, is 2 miles south of the town of Pickton and 4 miles northeast of the Coke field, Wood County. It is the fourth field in the East Texas basin to produce from the Bacon limestone zone of the Glen Rose. The

discovery well, Humble's C. D. Nichols No. 1, located in the Isaac Friddle Survey, was drilled to the total depth of 8,850 feet, or 220 feet in the Travis Peak, and was completed November 9, 1944, from casing perforations at 7,888-7,896 feet, for 620 barrels of 50° gravity oil per day, through a $\frac{1}{4}$ -inch tubing choke with a gas-oil ratio of 1,349 to 1, and tubing pressure of 1,710 pounds.

Leases on this prospect were first assembled on subsurface leads; however, the area was checked with seismograph previous to locating the discovery well.

SOUTH TYLER FIELD

The Phillips Petroleum Company's Mrs. W. J. McMinn No. 1, in the M. M. Long Survey, 5 miles South of Tyler, in Smith County, was completed on July 28, 1944, from casing perforations at 9,918-9,929 feet, for 281 barrels of 45.8° gravity oil per day, through a $\frac{5}{32}$ -inch tubing choke, with a gas-oil ratio of 6,040 to 1, and tubing pressure of 4,640 pounds. The electrical log indicated porosity from 9,864 to 9,960 feet, which, according to samples, consisted of porous, light-colored, fossiliferous limestone. This porous section has been tentatively identified as James limestone, which lies between the Rodessa and Pettit zones in the lower Glen Rose. While the James limestone is present in most of the East Texas basin, this is the first instance of favorable porosity development; it generally consists of hard, dense, brownish to dark gray to black, non-porous limestone.

The discovery well was drilled on a north-south structural ridge which was first identified from surface geology. This ridge was confirmed by subsurface when several dry Woodbine tests were drilled in the area. The Phillips Petroleum Company assembled leases after considerable core-drill and seismic work.

WINNSBORO FIELD

The Winnsboro field is 2 miles southwest of Winnsboro, in northeast Wood County. The discovery well, the Gulf Oil Corporation's K. C. Brewer No. 1, in the Benjamin Lee Survey, was drilled to the total depth of 8,719 feet and completed on March 25, 1944, through casing perforations from 7,990 to 8,014 feet, opposite porous limestone of the Rodessa series of Glen Rose age, for 230 barrels of 42.3° gravity oil per day, through tubing chokes, with gas-oil ratio of 1,095 to 1, and tubing pressure of 900 pounds. This porosity is locally referred to as the Bacon.

This limestone in this area consists of light gray to brown, oölitic, and fossiliferous limestone similar to that at New Hope, 6 miles northeast in Franklin County.

Prior to final completion, this well tested 5 barrels of 39.9° gravity oil per hour, through open 2-inch tubing, through casing perforations from 8,263 to 8,288 feet, opposite porous Gloyd limestone of the Rodessa series, after acidizing with 2,000 gallons, indicating two productive zones.

The Gulf's Mrs. Willie Hornbuckle No. 1, $\frac{1}{2}$ mile northwest of the Brewer No. 1, was drilled to the total depth of 9,141 feet, 507 feet in the Travis Peak.

Small gas showings were indicated by drill-stem tests through casing perforations in the most favorable appearing sections in the Travis Peak and Pettit. Final completion was made, October 24, 1944, through casing perforations from 8,210 to 8,240 feet, opposite porous Gloyd limestone, for 70 barrels of 46.9° gravity oil per day, through a 13/64-inch tubing choke, after 4,000 gallons of acid.

The structure is a faulted anticline trending northeast and southwest.

Leases were first assembled by the Gulf Oil Corporation in 1934, after surface geological work. Following the discovery of the Quitman field, at the southwest, the area was checked with seismograph, which subsequently led to the drilling of the discovery well.

DEVELOPMENT

The tendency toward deeper drilling continued through 1944, with 139 wells being drilled to the lower Glen Rose or deeper, as compared with 70 in 1943, or an increase of 100 per cent. As a result of this, 7 of the 10 new fields found production in the lower Glen Rose or deeper.

FIELD DEVELOPMENT

Fields producing from Paluxy or older formations accounted for a predominant part of the field operations.

CARTHAGE FIELD

The Carthage gas field, of Panola County, was the outstanding development for this year in the East Texas district. It was again extended and now includes approximately 150,000 acres. Gas reserves for the field are now estimated to be 5 trillion cubic feet. The number of producing wells was increased approximately 100 per cent during 1944, there being 34 producing wells as of December 31, 1944, 15 of which were dual completions. New outlets are being provided for the field and a rapid development is anticipated.

Rogers Lacy's Wm. Cameron Lumber Company No. 1, in the Wm. A. La Gronne Survey, was completed, June 15, 1944, flowing 26 barrels of 42° gravity oil per day, through casing perforations from 6,230 to 6,240 feet, opposite a porous Travis Peak sand, for the first oil production in the field. However, due to mechanical trouble, the well is now a gas-condensate producer.

EAST TEXAS FIELD

The following table shows the comparative number and status of wells in the East Texas field producing at the end of 1943 and 1944.

	1943	1944
Flowing	16,458	15,530
Gas "kick-off"	92	86
Gas lift	1,034	1,034
Pumping	7,180	7,683
Dead	309	294
Total	25,073	24,627

TABLE III
INTERESTING DRY EXPLORATORY TESTS

No. on Map	Name of Well	County	Location	Total Depth (Feet)	Oldest Formation Penetrated	Com- pleted	Results	Remarks
2.	Magnolia Pet. Co.'s H. Horwitz 1	Anderson	J. B. McNeely Sur., 10 mi. NW Palestine.	6,327	Salt (6002 ft.)	5-23-44	Abd.	Projected as lower Glen. test. Disclosed penetration-type salt dome
3.	W. A. Foster's P. I. Bowling 1	Cherokee	W. H. Walter Sur., 2 mi. SE Lone Star.	8,370	Travis Peak		Temp. abd.	Explored lower Glen. porosity on closed Up. Cret. structure lying against 1000 foot fault down on the north
5.	Humble O. & R. Co.'s J. F. Hague 1	Franklin	J. B. Riddle Sur., 6 mi. SE Mt. Vernon	11,516	Smackover	4-29-44	Abd.	Top Smackover limestone 11,232 ft. Penetrated 284 ft. with good porosity in upper 50 ft.
1.	Ivy & Moran's Murray & Sons 2	Houston	J. Durst Survey, 18 mi. SW Crockett.	8,507	Woodbine	4-21-44	Abd.	Extended area of Woodbine play south
6.	Humble O. & R. Co.'s E. M. Anderson 1	Hunt	J. Porter Survey, 5 mi. NW Greenville.	6,273	Paleozoic	4- 3-44	Abd.	No Smackover limestone. Buckner-Paleozoic contact
7.	Humble O. & R. Co.'s Mrs. L. Norman 1	Hunt	H. Thompson Survey, 4 mi. W. Greenville.	7,157	Paleozoic	2- 1-44	Abd.	150 ft. Smackover section, with porosity in upper 20 ft.
4.	Humble O. & R. Co.'s H. N. Wright 1	Morris	S. Story Survey, 1 mi. SW of Omaha.	11,817	Smackover	2- 2-44	Abd.	Top Smackover limestone 11,498 ft. Penetrated 326 ft. with porosity in upper 40 ft.
9.	The Texas Co.'s H. O. Solomon 1	Red River	W. E. Edwards Survey, 5½ mi. SW of Annona	6,152	Paleozoic	8-24-44	Abd.	90 ft. of Smackover, with slight porosity in upper part

Cumulative production, as of January 1, 1945, was 2,113,310,000 barrels.

Seventy-five salt-water injection wells were in operation in the East Texas field at the end of the year, as compared with 64 at the end of 1943. During December, 1944, salt water was being returned to the Woodbine formation at an average rate of 357,300 barrels per day.

During 1944 no wells were drilled, but 476 wells were abandoned. This makes a total of 2,774 wells abandoned since the field was discovered.

NEW HOPE FIELD

During the past year 24 oil wells have been completed in the New Hope field, Franklin County, all dual completions, with the exception of one which was a single completion.

During 1944 two new zones were proved productive: the Hill sand, of lower Glen Rose age, and an upper Travis Peak sand, referred to as the Elledge sand.

The Tide Water-Seaboard Oil Company's C. D. Elledge No. 1 was a new pay discovery, completed on March 11, 1944, in the Hill porosity of the Rodessa series of the lower Glen Rose. This well had an initial production of 412 barrels of 45.5° gravity oil per day, through a 10/64-inch tubing choke, through casing perforations from 7,433 to 7,446 feet, with a gas-oil ratio of 194 to 1, and casing pressure of 870 pounds.

The Tide Water-Seaboard Oil Company's J. P. Campbell No. 1 was a pay discovery, completed on February 21, 1944, flowing 205 barrels of 52.7° gravity oil per day, on a 9/64-inch tubing choke, through casing perforations from 8,156 to 8,190 feet, opposite porous Travis Peak sand, with a gas-oil ratio of 689 to 1, and tubing pressure of 1,300 pounds. This porosity is locally referred to as the Elledge.

The following table shows the number of completions in each producing zone.

Bacon limestone	Rodessa	13
Hill sand	Rodessa	15
Pittsburg sand	Pettit	21
Elledge sand	Travis Peak	4

MANZIEL FIELD

There were 22 oil wells completed during 1944, along with 2 gas wells and 4 dry holes, in the Manziel field, Wood County.

Four deep tests were drilled, 2 testing the lower Glen Rose and 2 testing the Travis Peak. One well penetrated the Travis Peak 440 feet. These tests resulted in 2 gas-distillate wells and 1 oil well from the Rodessa section, and 1 oil well from the Pettit section, all light producers.

PITTSBURG FIELD

In the Pittsburg field, Camp County, 15 oil wells were completed, making a total of 23 wells producing at the end of 1944, all of which are producing on a Kobe pump.

QUITMAN FIELD

At the Quitman field, Wood County, 11 producing oil wells and 9 dry holes were completed during the year. At the end of 1944 there was a total of 59 producing oil wells, all in the Paluxy.

INTERESTING WELLS

UPPER CRETACEOUS

John S. Ivy and W. T. Moran's Murray and Sons No. 2, in the John Durst Survey, 18 miles southwest of Crockett in southwest Houston County, has stimulated more lease play than any other well drilled in East Texas in 1944. Drilled to the total depth of 8,507 feet, where it had not reached the Lower Cretaceous, this test penetrated 627 feet of pre-Austin section, of which, according to the Schlumberger record, 315 feet was porous sand. Samples indicate this section to be white to gray, fine-grained to medium fine-grained porous sandstone. A core in the top of the sand section indicated a showing of oil. A drill-stem test produced salt water with only a small showing of oil.

A lease play has followed and an exploration play will undoubtedly follow the establishing of attractive pre-Austin sands this far south in the East Texas basin.

There has been considerable speculation about the nomenclature to be applied to the pre-Austin Upper Cretaceous sands in this well. In part, at least, they can be correlated with the upper Woodbine section found on the north in the East Texas basin, and in part appear to be the equivalent of the Tuscaloosa sands found on the east in northern Louisiana and Mississippi.

LOWER CRETACEOUS

Another penetration-type salt dome in the East Texas basin was proved when the Magnolia Petroleum Company's Henry Horwitz No. 1, in the J. B. McNeely Survey, 10 miles northwest of Palestine, Anderson County, drilled salt from 6,002 to 6,327 feet, total depth. The Horwitz well was the fourth to be drilled on this prospect by the Magnolia. The first well, the Magnolia's W. C. Campbell No. 1, also in the J. B. McNeely Survey, the only commercial producer, was completed on April 24, 1942, in Woodbine sand, at 4,523-4,540 feet, pumping 201 barrels of 12.2° gravity black oil per day. It has since been abandoned after producing approximately 16,000 barrels. The Horwitz well, located on the east flank of the structure, was intended as a deep test.

W. H. Foster et al. P. I. Bowling No. 1, in the W. H. Walter Survey, 2 miles southeast of Lone Star, in east-central Cherokee County, was drilled on a faulted structure which produces oil from the Woodbine. This faulted structure, with 200 feet of closure on the Upper Cretaceous beds against a fault downthrown on the north with approximately 1,000 feet of throw, is located on the southwest flank of the Sabine uplift, in structural relation similar to that occupied by the Rodessa structure, on the north flank of the Sabine uplift.

After drilling to the total depth of 8,370 feet, 93 feet into the Travis Peak,

operators first tested the only favorable appearing porosity below the Rodessa. This porosity, from 8,002 to 8,018 feet, 70 feet in the Pettit section, consisted, according to samples, of gray to brown, finely oölitic, porous limestone. It produced salt water when tested through casing perforations.

The Rodessa section had a showing of gas and a small showing of oil after acid, through casing perforations from 7,376 to 7,388 feet and 7,340 to 7,364 feet, respectively. These sections, according to samples, consisted of gray to dark gray, hard, finely crystalline, fossiliferous, slightly porous limestone. At the end of the year the well was shut down pending further testing.

The Lone Star Producing Company's C. H. Lee No. 1, in the Boly C. Walters Survey, 3 miles north of Athens, Henderson County, appeared at the end of the year to be a discovery well in a limestone porosity just below the massive anhydrite section of the Glen Rose. This well was drilled to the total depth of 9,240 feet, 300 feet in the Travis Peak. Through casing perforations from 8,198 to 8,208 feet, it had tested 12 barrels of 47.6° gravity oil per hour, through a 5/32-inch tubing choke, with a gas-oil ratio of 1,600 to 1, and tubing pressure of 1,545 pounds. Samples indicated the producing zone to consist of gray to brown, dense to porous, crystalline, fossiliferous and oölitic limestone. The Lone Star Producing Company assembled its leases and made location for this test after a seismograph survey in the area.

JURASSIC

Ten Jurassic tests were drilled in the East Texas area in 1944, 9 reaching the Smackover limestone and 1 penetrating the Cotton Valley about 1,250 feet. Of these tests, only 1 was productive, the Barnsdall Oil Company's Heilbron No. 2, Bowie County, a Smackover limestone oil well, and the discovery well of the Eylau field. This field is significant in that it is the first Smackover limestone production for Texas.

Most of the Smackover limestone tests were drilled along the flank or updip areas of the East Texas basin, and were located from Bowie County (Eylau field), on the northern flank, to Robertson County (Hill's Anderson No. 1, 8),³ on the extreme southwestern flank. The two most basinward tests were located in central Morris County (Humble's Wright No. 1, 4), and east-central Franklin County (Humble's Hague No. 1, 5), and here the Smackover limestone was encountered below 11,000 feet. Favorable development of porosity in the Smackover has been found in the more downdip areas. Porosity and limestone development has disappeared not far updip in each area tested. The present exploration of the Smackover limestone formation has resulted in definite substantiation of the prediction that it would disappear updip by thinning and depositional gradation, rather than by truncation or sharp depositional breaks.

The Humble Oil and Refining Company's Smackover limestone tests in Hunt County (the Anderson No. 1, 6, and the Norman No. 1, 7), very thor-

³ Numbers in italics indicate numbers in Figure 1.

oughly explored the updip development of the Smackover, previous tests being located downdip in areas of good limestone and porosity development, with the more recent tests spaced updip at right angles to the strike of the beds. These wells in Hunt County showed a remarkable uniformity of updip thinning and the loss of porosity was quite consistent with limestone development. No showings of oil and gas were encountered, which could be attributed solely to this updip gradation. This was to be expected and further extensive exploration of the Smackover limestone will be in areas where both structure and porosity are expected.

The Smackover limestone development in East Texas can be summed up as both favorable and unfavorable to the possibility of finding prolific Smackover fields: favorable in the discovery of oil in Bowie County; favorable in the presence of porosity and permeability in at least the upper part of the downdip areas of the northern part of the East Texas basin; and unfavorable in the absence of a sharp updip break in limestone and porosity development.

The one Cotton Valley test drilled in the East Texas area in 1944, the Continental Oil Company's Burnett No. 1, a deep test in the Carthage field, Panola County, encountered showings of gas and oil in a Cotton Valley penetration of 1,250 feet. Production tests failed to result in commercial production in any of these sands, which were generally low in porosity and permeability. Additional exploration of the Cotton Valley sands will undoubtedly be attempted on this large low-relief Carthage structure.

Future Jurassic exploration will reveal much needed additional information in regard to the possibilities of these zones in the East Texas area. At the end of 1944 there were five active Jurassic tests, as shown in Table IV.

The most important of these projected deep tests is the Sinclair Prairie Oil Company's D. D. Shofner No. 1, on the Chapel Hill structure, Smith County. This is a proposed Smackover limestone test and is, by far, the most basinward Jurassic exploration so far attempted.

TABLE IV
LIST OF ACTIVE JURASSIC TESTS, JANUARY 1, 1945

<i>Name of Well</i>	<i>County</i>	<i>Location</i>	<i>Objective</i>	<i>Remarks</i>
H. C. Cockburn Oil Co.'s H. C. Cockburn, et al. 1	Falls	D. Barclay Survey, 9 mi. E. of Marlin	Smackover	Drilling at 6150 ft. in Cotton Valley
Ohio Oil Co.'s V. Popper 1	Hunt	O. M. Roberts Survey, 4 mi. NE. of Quinlan	Smackover	Drilling at 500 ft.
McAlester Fuel Oil Co.'s J. B. Hunt 1-a	Panola	Wiet Anderson Survey, 4 mi. SE. of Carthage	Cotton Valley	Testing. Total depth 9022 ft. in Cotton Valley
Sinclair Prairie Oil Co.'s D. D. Shofner 1	Smith	Wm. Dickerson Survey, Chapel Hill field	Smackover	Drilling at 4800 ft. in Georgetown
Humble Oil & Refg. Co.'s C. C. Searcy 1	Titus	W. H. Gilbert Survey, 1 mi. S. of Mt. Pleasant	Smackover	Drilling at 10,900 ft., Cotton Valley

DEVELOPMENTS IN SOUTH TEXAS IN 1944¹

BRUCE SCRAFFORD²

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ABSTRACT

Development in South Texas for 1944 is the highest on record since the year of 1937-38. Production records achieved a new high for the district, 128,865,000 barrels of oil. Renewed interest in the faultline trend has been based on the possibilities of obtaining commercial production from formations of the Lower Cretaceous and Jurassic age. Continued activity in the Wilcox trend resulted in the discovery of 33 per cent of the new fields of the district. The discoveries of the upper Eocene trend are found to be of inferior quality as compared with the average of the reservoirs previously established in this trend. The reservoirs of the Frio-Vicksburg remain the source of the major oil and gas reserves of the South Texas district. Continued development of the known fields is resulting in additional reserves from new reservoirs. The export of large quantities of gas from the South Texas district has effected an increase in the value of the gas reserves of the area.

INTRODUCTION

The South Texas district, embracing the 61 counties shown on Figure I, is the area referred to by the Railroad Commission of Texas Oil and Gas Division as Districts 1, 3, and 4.

For convenience, because of the large size of the South Texas district, development in this area has been subdivided into stratigraphic divisions based on the geologic age of the various production trends. These subdivisions, previously suggested by Kidd, are as follows.³ (1) the Ordovician and Pennsylvanian of the Edwards Plateau; (2) the Cretaceous of the Balcones fault zone; (3) the Wilcox, Carrizo, Queen City, and Sparta of the Lower Eocene trend; (4) the Yegua and Jackson of the upper Eocene; (5) the Frio-Vicksburg group of the basal Oligocene; and (6) the upper Oligocene and lower Miocene of the coastal area, including the *Marginulina*-Frio, Catahoula, and Oakville.

DEVELOPMENT

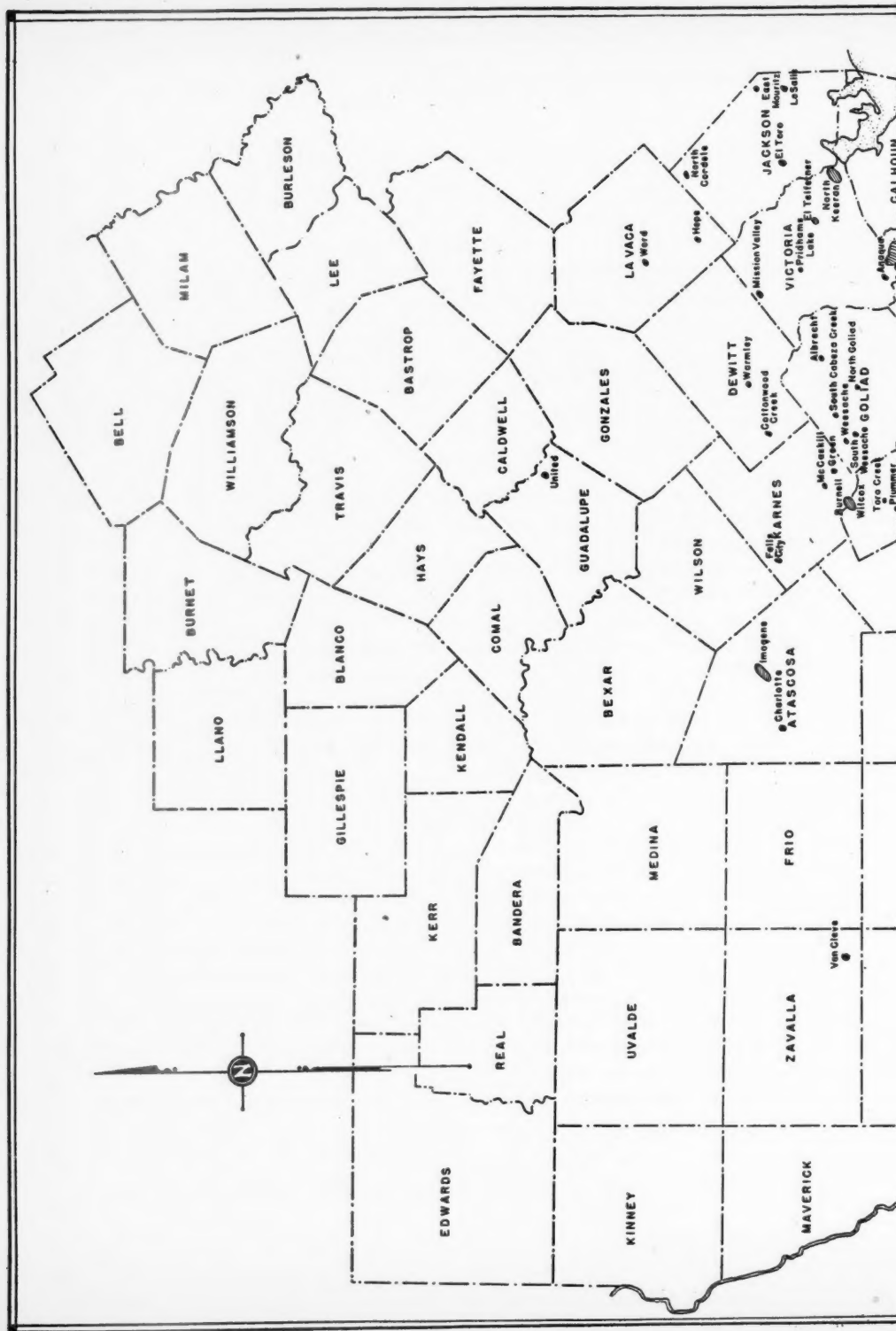
In all, 1,401 wells of all categories were drilled in the South Texas area during the year of 1944, an increase in the rate of development of 22 per cent over that of the previous year. Four hundred and forty-eight exploratory tests, wildcat and semi-wildcat wells, were drilled and resulted in the discovery of 57 fields and the extension of productive limits of 23 proved fields. The fields discovered in 1944 are tabulated in Table I. Figure I shows the location of the new discoveries as well as the fields which were extended or new pools established during the year. Of the 953 wells drilled in proved areas 603 were completed as oil wells and 102 as gas or gas-condensate wells. Eighty-four of the wells in proved area and three wildcat wells were dually completed.

The rate of development in the South Texas area for 1944 is found to be the

¹ Manuscript received, April 2, 1945.

² Consulting geologist, 2000 Driscoll Building.

³ Gentry Kidd, "Developments in South Texas, 1938-1939," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 23, No. 6 (June, 1939), pp. 860-70.



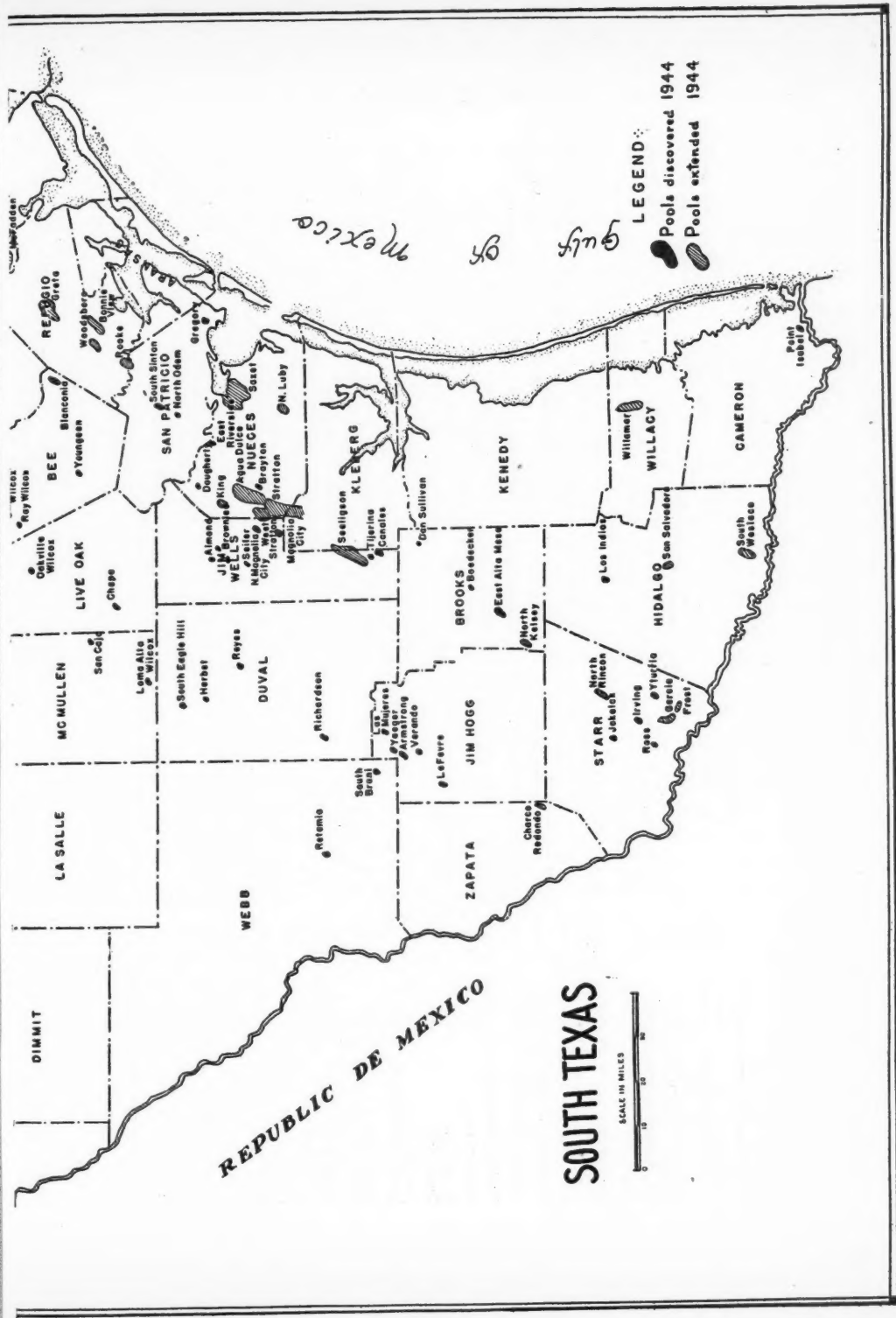


FIG. 1.—Oil and gas fields in South Texas.

TABLE I
SOUTH TEXAS FIELDS DISCOVERED IN 1944

County and Field	Type	Com- pletion Date	Discovery Well	Survey	Depth of Producing Formation (Feet)	Initial Production (Bbls. per Day)	Choke (Inches)	Producing Trend
Atascosa: Charlotte	Oil	8-9-44	Humble Oil & Ref. Co., E. J. Pruitt 3	A. Estrada 53	6,017	176	3/16	Cretaceous
Bee: Plummer-Wilcox	Oil	11-1-44	Magnolia Petr. Co., W. F. Exp 1	I. B. Atkins, Ab-537	6,974	74	7/64	Wilcox
Bee: Toro Creek	Oil	7-20-44	Dicks Bros. et al., J. E. Robinson 1-A	Hahl S/D Uruanga Grant	3,883	38	Open 2-	Jackson-Yegua
Bee: Ray-Wilcox	Gas-dist.	1-10-44	E. B. Zachry, Campbell 1	Brooks & Burleson	7,581	14,000 MCFGD, 20 bbls.	Open flow	Wilcox
Bee: Youngey	Gas	3-8-44	W. E. Rowe, Peters 1	Edwin Morehouse 237	3,796	Est. per 1,000 MCF	1/8	Frio-Vicksburg
Brooks: Dredger	Oil	8-29-44	Sun Oil Co., Eedeker 1	Edman 16, Ab-268	8,102	Est. 1,500 MCFGD		Frio-Vicksburg
Brooks: Dredger	Oil	8-29-44	Sun Oil Co., Dredger 1	Edman 16, Ab-268	8,102	S.L. Gas well	0/64	Frio-Vicksburg
Brooks: East Alta Mesa	Gas	11-17-44	Standard Oil Co. of Texas, 4	La Encantada Grant	7,387	11 to 12 million CFG	Open flow	Frio-Vicksburg
Brooks: Scott & Hopper	Oil	3-15-44	Braulia Garcia Lee, 1			spray distillate S.L.		
Cameron: Point Isabel	Gas	8-10-44	Humble Oil & Ref. Co., Scott & Hop- per 1	A.C.H. & B. 107	6,556	230.0	3/16	Frio-Vicksburg
Dewitt: Cottonwood Creek	Gas-dist.	4-10-44	Pure Oil Co., Yturria Land & Livestock Co., 1-A	Santa Isabel Grant	6,042	6,000 MCFG	Open flow	Oligocene
Dewitt: Warmley	Oil	2-24-44	Atascosa Fuel Oil Co., Bushrig 1	J. F. Kemper Ab-287	7,697	5,200 MCFG & 43 bbls.		Wilcox
Duval: Herbat	Oil	7-28-44	National Bank 1	James Warmley Ab-492	7,085	36	3/16	Wilcox
Duval: Keys	Oil	3-20-44	J. W. Gorman, Herbst 2	H & GN 67	2,832	40	Pump	Jackson-Yegua
Duval: Richardson	Oil	12-23-44	American Republic Corp., Richard- son 1	NW 1/2 of Survey 18	3,945	88.29	Pump	Jackson-Yegua
Duval: South Eagle Hill	Oil	6-6-44	T. Graham, M. J. Richardson 2	G.B. & C.N.G. 3	1,784	33	Pump	Jackson-Yegua
Goliad: Albrecht	Oil	9-6-44	Harvey & Henderson, J. F. Welder Hrs. 1	S. Alexander 102	2,069	22	Pump	Jackson-Yegua
Goliad: North Goliad	Gas	6-5-44	Continental Oil Co., V. Albrecht 1	M. Carriona Ab-308	8,340	75	1/4	Wilcox
Goliad: S. Cabeza Creek	Dist.	5-24-44	Continental Oil Co., S. H. Reed 1	Sebastian Vela Ab-337	8,366	83 bbls. dist.	1/4	Wilcox
Goliad: Wesatche	Oil	4-30-44	Continental Oil Co., S. H. Reed 1	Sebastian Vela Ab-337	8,490	3,000 MCFG & 85 BDPD	1/8	Wilcox
Guadalupe: United	Oil	5-25-44	H. H. Coffield et al., L. W. Chilton 1	John F. Payne	7,979	47		
Hidalgo: Los Indios	Gas-dist.	6-17-44	United North & South Development Co., Max Webb 1	Benjamin Fugua	2,788	213.35	3/16	Cretaceous
Jackson: East Mauritz	Oil	6-8-44	Baldrige, King, Nichols & Sohio, Estate of Richard King 1	San Salvador Del Tule	6,822	3,911 MCFG	1/4	Frio-Vicksburg
Jackson: El Toro	Gas	7-24-44	Butcher-Artlen Co., Hagan 1	M. C. 15, Ab-329	5,662	52	3/32	Frio-Vicksburg
Jackson: La Salle	Oil	1-11-44	Seaport Oil Co., Bennett 1	J. Linn	5,802	Est. 1,350 MCFG dry		Frio-Vicksburg
Jackson: North Cordele	Gas	6-16-44	(Dual Completion)	R. Musquez Ab-57	5,062	48.27	Open flow	Frio-Vicksburg
Jim Hogg: Las Mujeres	Oil	5-10-44	Akron Production Co., J. Werdon 2	I & GN 2 Block 4	4,128	36,200 MCFGD	Open flow	Upper Oligocene
			Standard Oil Co. of Texas, Canales 1	Ab-127		90,000 MCFGD	Open tub.	Jackson-Yegua
				Diego Hinojosa Grant Ab-357	5,102	18		

TABLE I—Continued

County and Field	Type	Completion Date	Discovery Well	Survey	Depth of Formations (Feet)	Initial Production (Bbls. per Day)	Choke (frac. of Inches)	Producing Trend
Jim Hogg: Le Fevre	Oil	12- 1-44	Frank B. Le Fevre, A. Martinez	S/D of Share 2, Las	1,750	50	Pump	Jackson-Yegua
Jim Hogg: Verando	Gas	1-18-44	The Texas Co., Yeager 3	R. Garza 222 Ab-123	2,898	6,400 MCFGPD	Open flow	Jackson-Yegua
Jim Wells: Almond	Gas	3-31-44	Wilcox Oil & Gas Co., Almond 1	S.A. & M.G. 13	3,222	1,500 MCFGPD	1/4	Frio-Vicksburg
Jim Wells: Brownlee	Oil	2-10-44	Humble Oil & Ref. Co., E. M.	J. Wright 10 Ab-543	4,940	32	1/8	Frio-Vicksburg
Jim Wells: Canales	Oil	1- 8-44	Sun Oil Co., A. T. Canales 1	C.C.D. & R.G.N.G.	7,233	213.84	7/64	Frio-Vicksburg
Jim Wells: Seiler	Gas	3-25-44	Highland Oil Co., Joe Seiler 1	345 Vaca Grant	4,960	5,500 MCFGPD	10/64	Frio-Vicksburg
Jim Wells: Tijerina	Oil	12-12-44	The Texas Co., H. C. Tijerina 1	A. Canales 270 Ab-76	3,712	370	3/16	Frio-Vicksburg
Karnes: Falls City	Oil	12-12-44	Southern Minerals Corp., Bartosch 1	L. Manchaca Gr. Ab-5	4,651	20	9/64	Wilcox
Karnes: Green	Oil	5-10-44	Magnolia Petr. Co., R. Atkinson 1	Carlos Martinez Grant	6,537	68		Wilcox
Karnes: McCaskill	Gas	11-18-44	H. R. Smith & W. C. McBride,	Victor Blanco Ab-3	7,404	18,000 MCFGPD	Open flow	Wilcox
Lavaca: Hope	Gas	9-26-44	W. C. McCaskill, F. Co. M. Hoffman 1	David B. Oakies	7,716	3,800 MCFGPD	1/4	Wilcox
Lavaca: Word	Gas	11- 7-44	Merline Oil Co., Jack Frazier, Joe	James Kerr	5,872	1,350 MCFGPD	Open flow	Wilcox
Live Oak: Chapa	Gas-dist.	1-14-44	Continental Oil Co., Somerset Land	T.T.R.R. 319 Ab-517	8,127	34 BDPD plus 1,750 MCFG	1/8	Wilcox
Live Oak: Oakville-Wilcox	Gas-dist.	9-23-44	Henderson Coquat, L. A. Reagan 3	S. McGloin Ab-29	6,956	S.I. gas-dist. well	9/64	Wilcox
McMullen: Loma Alta	Oil	6- 1-44	Atlantic Ref. Co., Mrs. J. W.	Martina J. Deen 13,	6,866	102	1/4	Wilcox
McMullen: San Caja	Oil	5-20-44	E. M. Smith, H. Ezell 2-C	W. D. Hodges 330	6,430	52.01	1/4	Wilcox
Nueces: Brayton	Oil	6-14-44	(Dual Completion)	Ab-064	6,901	127.17	1/4	Frio-Vicksburg
Nueces: Dougherty	Gas	3-22-44	H. R. Smith & McBride Inc.,	Palo Alto Grant	7,197	131	1/8	Frio-Vicksburg
			W. H. Rivers Estate 1	Casa Blanca Grant	5,550	1,500 MCFGPD & 5 bbls. dist	1/4	Frio-Vicksburg
			Hewitt & Dougherty, Celestia Dod-	Ab-221 Bluntzer				
			son 1					
Nueces: East Riverside	Oil	3-27-44	Stanford Oil & Gas Co., Thompson 3	Nueces County Winter	6,297	154	1/8	Frio-Vicksburg
San Patricio: Gregory	Oil	3-15-44	Humble Oil & Ref. Co. (Butcher-	Garden S/D	9,120	270	1/4	Frio-Vicksburg
San Patricio: North Odem	Oil	1-27-44	Arthur), James F. Green Estate 1	T. T. Williamson 42	5,430	07.2 jetting	1/4	Frio-Vicksburg
Starr: Irving	Gas	12-20-44	Texas Conservative Oil Co., Gaines 1	W. C. Burgess Ab-46	3,288	60,000 MCFGPD wet	Open flow	Frio-Vicksburg
Starr: Jaktak	Gas	8- 9-44	Geo. Irving, M. M. Garcia 1	Porcion 90	2,063	Dry gas well MCFGPD	Open flow	Jackson-Yegua
Victoria: Mission Valley	Gas	12- 1-44	E. Stephens, Rhinoga et al. 4	Porcion 11	3,350	4,933 MCFGPD	Open flow	Frio-Vicksburg
Victoria: Mission Valley	Gas	12- 1-44	Gulf Oil Co., M. M. Garcia 6	Porcion 11	3,350	4,933 MCFGPD	Open flow	Frio-Vicksburg
Victoria: Pridham's Lake	Oil	7- 4-44	Northern Ordnance Co., W. F. Heath 1	Eben Halen Ab-58	4,270	107	9/64	Wilcox
Webb: Retamia	Gas-dist.	2-14-44	Kingwood Oil Co., A. Wilden 1	Victoria Town Grant	4,962	2,250 MCFGPD plus 25 BDPD	7/16	Wilcox
			Phillips Petr. & Texas Gulf,	J. V. Borrego Grant				
			A. M. Bruni Estate 1					
Webb: South Bruni	Oil	2-23-44	Chas. E. Fraser (J. B. Burton)	Survey 447	1,810	21	Pump	Jackson-Yegua
			A. M. Bruni Estate					
Zavalla: Van Cleve	Gas	6-44	The Texas Co., Willie M. Van Cleve 1	Ab-1216	1,960	475,000 CFGPD	1/4	Cretaceous
						S.I. gas well		

highest on record since the year of 1937-38. A downward trend in the rate of development was commenced in 1942 as a result of the inability of the operators to market the production from the area. As marketing facilities were improved during 1943 the downward trend ceased abruptly and by early 1944 all available drilling equipment obtainable was in operation. Increased demands for drilling equipment created a shortage in this commodity, resulting in a raise in the cost of development and, as in the previous two war years, there was a noticeable lack of skilled labor, decreasing the efficiency of drilling operations which also directly affected the increased cost of development.

PRODUCTION

Production from the South Texas pools attained an all-time high as 128,865,000 barrels were produced for market. This represents an increase in the annual rate of withdrawal of 20 per cent over that of the preceding year and a 44 per cent increase over that produced during 1942.

On completion of the gas line from the Agua Dulce-Stratton fields of Nueces County to West Virginia in the fall of 1944 the area received its first major outlet for the sale of dry gas. The line, capable of delivering 200,000,000 cubic feet of gas daily from the South Texas area to West Virginia, immediately increased the value of gas reserves in the area. Plans are now under way to extend this existing line and to increase its load capacity. Additional marketing lines to export gas from the area are pending.

EDWARDS PLATEAU

During the 1944 year there was an increase of interest in the possibilities of developing additional Ordovician and Pennsylvanian production in the Edwards Plateau area. Activity was limited for the most part to geophysical exploration and an extensive lease play.

CRETACEOUS FAULT LINE

Three new field discoveries were made along this trend, one in the deep Edwards, the Charlotte field in Atascosa County, discovered by the Humble Oil and Refining Company. This new discovery is southwest and on strike with the Imogene field, also producing from the deep Edwards. The discovery well, the Humble Oil and Refining Company's C. J. Pruitt No. 3 was completed producing from 6,917-6,923 feet at a rate of 176 barrels of 37.7° gravity oil.

The Texas Company's W. M. Van Cleve No. 1, Frio County, was successfully completed as a small gas well in the Navarro. Although this well may be considered to be of minor commercial importance it has renewed interest in the southwestward extension of a trend into an area that in the past has not enjoyed serious exploration due to the lack of transportation facilities.

The United North and South Development Company's Max Webb No. 1

opened a new area of production 2 miles south of the old Luling field. The discovery well of the United field is producing from the Del Rio.

The possibility of encountering commercial production from the formations of Lower Cretaceous and Jurassic age in the area adjacent to the Balcones fault-line trend is a play that is developing interest. Extensive geophysical exploration has taken place along this trend and a lease play has been made on the basis of this information. While the few exploratory tests that have been drilled to these horizons have been unsuccessful in obtaining commercial production the information thus garnered has been encouraging. Two projected Jurassic tests are now drilling and several others are scheduled for the year.

LOWER EOCENE TREND

The Wilcox trend was accorded considerable attention during 1944 and, as in the previous 2 years, accounted for a large percentage of the total discoveries for the year. Activity in this trend extended from Lavaca County on the northeast to Zapata County on the Rio Grande River and resulted in the discovery of 5 oil fields and 14 gas fields, 33 per cent of the discoveries of the district.

The development of the lower Eocene in South Texas has proved the Wilcox formation to be a major gas reserve. Few first-rate oil reservoirs have been discovered to date but, as the present known gas structures are developed, many will undoubtedly be found to possess commercial oil columns lower on the flanks. Two Wilcox structures, previously considered only as gas reserves, have as a result of development during the past year been proved to possess oil columns.

Wilcox oil production was extended northeast into Lavaca County by the Moran Corporation's Joe W. Lell *et al.* No. 1, discovery well of the Word field, which was completed through perforations from 5,914-5,919 feet for 99 barrels of 35° gravity oil.

The oil production of this trend was extended southwestward to southern McMullen County by the Atlantic Refining Company's Atkinson No. 1, discovery well of the Loma Alta-Wilcox field, which was completed through perforations from 6,866-6,869 feet for 102 barrels of 37° gravity oil.

The Wilcox development in northern Goliad and Dewitt counties has established several structures that appear to have possibilities for large gas reserves. Additional gas structures were discovered in Lavaca, Victoria, Bee, Live Oak, and McMullen counties. The San Caja field, east-central McMullen County, discovered by E. M. Jones' H. Ezzel well No. 2-C and dually completed from 6,439-6,453 and 6,901-6,916 feet, is of importance as a gas reserve with possibilities of a commercial oil column.

UPPER EOCENE

The Jackson-Yegua trend accounted for 18 per cent of the new discoveries in the district, 8 oil fields and 2 gas fields. These fields, as a whole, seem to be of inferior quality as compared with the average of the reservoirs previously established in this trend.

Of equal importance with the new fields discovered in this trend are the new reservoirs encountered in previously established fields. Additional reservoirs were developed in the Agua Prieta field and the Thomas Lockhart field of Duval County, and extensions were made in the Armstrong and Yaeger fields of Jim Hogg County.

FRIO-VICKSBURG

The exploratory development in the Frio-Vicksburg trend resulted in discovery of 12 oil fields and 12 gas fields. For several years past the fields of this trend have accounted for the majority of the more prolific oil and gas reserves of the South Texas district. Although additional development is necessary to determine the magnitude of the newly discovered reservoirs, several of these fields, based on present information, seem to be of superior quality. The Canales and Tijerina fields of Jim Wells County, immediately south and southeast of the Seeligson structure, the Scott & Hopper field and East Alta Mesa field of Brooks County appear to be of major importance.

Continued exploration of the previously established major structures in this trend is still paying dividends in additional reserves. New pools, both oil and gas, have been established during the year in the Agua Dulce-Stratton-West Stratton fields of Nueces and Kleberg counties, the Seeligson field of Jim Wells and Kleberg counties, the Garcia, Yturria, Frost, and North Rincon fields of Starr County, and in the McFadden and North Keeran fields of Victoria County. Hence, the multiple pool fields of the Frio-Vicksburg trend remain the source of the major reserves of the district.

A contributing factor in the retarded development of the southern counties of this trend, Hidalgo, Willacy, and Cameron counties, has been the lack of adequate marketing facilities. However, in view of the intense development the remainder of the trend has received, operators have recently been looking to this comparatively undeveloped portion of the trend for structural prospects worthy of exploratory tests. The development of the Frio-Vicksburg structures of this area have to date failed to disclose any oil reserves of importance but have uncovered large gas reserves.

The Gregory field, discovered by the Humble Oil and Refining Company's Green Estate No. 1, in San Patricio County, renewed interest in the possibilities of the finding of commercial production in the deep Frio-Vicksburg. The productive possibilities of the lower sand members of this formation will undoubtedly create renewed activity in many of the known fields of this trend.

UPPER OLIGOCENE AND LOWER MIOCENE

Two new discoveries, of relatively minor importance, were made in the upper Oligocene and lower Miocene trend in 1944. New producing sands were found in three known fields.

DEVELOPMENTS IN UPPER GULF COAST OF TEXAS IN 1944¹

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ABSTRACT

This report is confined to the Upper Gulf Coast of Texas; it does not include, as in past years, the Gulf Coast of Louisiana.

Wildcat drilling increased 13 per cent over 1943. Discoveries increased in number from 11 in 1943 to 17 in 1944. Their over-all quality was poor and their effect on production rates and reserves will be small.

Production increased 27 per cent over 1943. The increase is attributed principally to routine drilling in partially developed fields with the resulting extensions, new sands, and new structural reservoirs rather than to increased allowables for previously completed wells, as was the case in 1943. Consequently, field wells completed in 1944 increased 75 per cent in number over 1943.

Most of the exploratory tests in 1944 were drilled on subsurface prospects, the majority of which were localized by geophysical methods. Geophysics has had its greatest success in the Upper Gulf Coast of Texas and is an indispensable aid in determining geologic structure. Geophysical exploration showed a gain in crew-weeks of 7 per cent over 1943 with most of this gain occurring in the Wilcox trend.

One new geologic trend, the Woodbine sand, was opened to exploration in the north-central part of the district.

INTRODUCTION

This report is confined to the Upper Gulf Coast of Texas; it does not include, as in past years, the Gulf Coast of Louisiana. The two districts are treated in separate papers.

The Upper Gulf Coast district of Texas extends from Matagorda County, Texas, eastward to the Louisiana state line and inland 100 to 140 miles from the Gulf of Mexico. The 26 counties included in the district are shown on the map in Figure 1.

DEVELOPMENT

Drilling activity in the district increased. Wildcat drilling rose to 139 operations in 1944 as compared with 101 in 1943, an increase of 13.7 per cent. Discoveries increased from 11 in 1943 to 17 in 1944. Field wells, however, rose to 422 operations as compared with 252 wells in 1943, an increase of 75.4 per cent. This is the greatest number of field wells drilled in any of the 3 years since the beginning of the war, but is less than half of the average of the 3-year period immediately prior to the war. Production increased 27 per cent over 1943 and thereby reached an all-time high. This should be credited chiefly to an increase in field wells and not to an increase in allowables of previously completed wells, as was the case in 1943.

¹ Manuscript received, March 26, 1945. Published by permission of the Magnolia Petroleum Company.

² Magnolia Petroleum Company, Box 111. The writer acknowledges with thanks the several friends who critically read the manuscript and especially A. J. Bauernschmidt, Jr., who also drafted the accompanying map.



FIG. 1.—Location of discoveries, extensions, and new sands on old domes in 1944.

NEW FIELDS DISCOVERED

Ten of the seventeen new discoveries in 1944 are classed as oil fields, 6 as gas-condensate fields, and one as a dry gas field. Of these, 4 are producing from the Wilcox formation and 4 from the Yegua, both of Eocene age, 8 from the Marginulina-Frio of Oligocene age, and one from undifferentiated beds of Miocene age. Seven of the 17 discoveries were still one-well fields at the close of the year. The over-all quality of the discoveries was poor and their effect on production rates and reserves will be negligible. The new discoveries with pertinent data are listed in Table I and their locations are shown on the map of Figure 1.

TABLE I
FIELDS DISCOVERED IN UPPER GULF COAST OF TEXAS IN 1944

Field Name	County	Operator	Discovery Well	Producing Formation	Producing Depth (Ft.)	Initial Production
1. Beech Creek	Hardin	Republic-Houston	H&TC Fee 1	Yegua	6221-43	273 bbls; 1" ck; Gr. 36.6°; R 1774-1
2. Columbus	Colorado	Cities Service	C. K. Gay 1	Wilcox	7302-14 7667-70 Dual	69 bbls; 1" ck; Gr. 62°; R 33,800-1 97 bbls; 1" ck; R 19,530-1
3. Daboval	Wharton	Amerada	C. J. P. Daboval 1	Frio	7025-27	80 bbls; 1" ck; Gr. 56.7°; R 6370-1
4. Frelsburg	Colorado	Sinclair	A. J. Thompson 1	Wilcox	8177-82 9288-94 Dual	73 bbls; 1" ck; Gr. 65°; R 43,288-1 50 bbls; 1" ck; Gr. 59°; R 12,760-1
5. Hungerford	Wharton	Superior	W. J. Hudgins 1	Miocene	3026-31	2,257,000 cu. ft. dry gas; 1" ck
6. Lane City	Wharton	General Crude	Security Bank 2	Frio	5345-50	124 bbls; 1" ck; Gr. 26.1°; R 1613-1
7. Mayes	Chambers	Humble	M. E. Mayes 1	Frio	8166-69	752 bbls; 1" ck; Gr. 41.8° R 912-1
8. Nada	Colorado	Ohio	C. W. McDermott 1	Yegua	6512-20	98 bbls; 1" ck; Gr. 52.2°; R 10,500-1
9. North Beech Creek	Hardin	Republic-Houston	O. Sternenberg 1	Yegua	6230-32	370 bbls fluid=111 bbls; 1" ck; Gr. 34.8°; R 816-1
10. North Winnie	Chambers	Sun-Shell	Doughtery-Pool 1	Frio	8757-59	154 bbls; 1" ck; Gr. 38.3°; R 2526-1
11. Glasscock	Colorado	Sinclair	C. G. Glasscock 2	Wilcox	9203-68 9216-26 9274-80 Not Dual	120 bbls; 1" ck; Gr. 51°; R 12,900-1
12. Smith Point	Chambers	Standard of Texas	State 1-109	Frio	8135-46	250 bbls; 1" ck; Gr. 42°; R 800-1
13. South El Campo	Wharton	Seaboard	W. W. Duson 1	Frio	6150-54	185 bbls; 1" ck; Gr. 34.6°
14. Spring	Harris	Eltex	Bender Est. 1	Yegua	6244-47	116 bbls; 1" ck; Gr. 38.3°; R 300-1
15. Sublime	Colorado	Tidewater	D. L. Underwood 1	Wilcox	9500-05	79 bbls; 10/64" ck; Gr. 48°; R 18,800-1
16. Ashwood	Matagorda	Skelly	C. B. Granbury 1	Frio	8730-47	42 bbls; 1" ck; Gr. 51.3°; R 50,308-1
17. Village Mills	Hardin	Republic-Houston	Hardin Co. School Lands 1	Yegua	5794-5808	23 bbls; 18/64" ck; Gr. 69.4°; R high.

Abbreviations: 1" ck, 1-inch choke; Gr., gravity; R, gas-oil ratio.

Gas-condensate discoveries.—The Nada field, due to lease demands, was the only one of the six new gas-condensate fields in which more than one producing well was completed during the year. In this field three producing wells were completed. A second test in the Frelsburg field resulted in a dry hole.

Oil discoveries.—Four of the ten new oil fields were still one-well fields at the close of the year. No second test was drilled in the Lane City field, of Wharton

TABLE II
IMPORTANT EXTENSIONS AND NEW SANDS IN UPPER GULF COAST OF TEXAS IN 1944

Field	County	Operator	Well	Producing Formation	Producing Depth (Ft.)	Initial Production	Remarks
Danbury	Brazoria	Humble	Devorsky 1	Frio	8036-54 8074-84	3,000,000 cu. ft. gas, small amount condensate; $\frac{1}{4}$ " ck.	New gas sand on southeast flank of dome
Chocolate Bayou	Brazoria	Phillips	Plummer 1	Frio	11,464-69	2,300,000 cu. ft. 198 bbls. condensate; $\frac{1}{4}$ " ck.	Extended production $\frac{1}{4}$ mile northeast
Millican	Brazos	Phillips	Weems 1	Wilcox	3104-07	2,853,000 cu. ft. gas; $\frac{1}{4}$ " ck.	Extended gas production to north flank of dome
Seabreeze	Chambers	Sun	Thompson 1	Frio	9450-75	1,500,000 cu. ft. gas and 55 bbls. condensate; $\frac{1}{4}$ " ck.	Extended production $1\frac{1}{4}$ mile southeast
Blue Ridge	Ft. Bend	Phillips	Robinson 3	Frio	4102-04	187 bbls; $\frac{1}{4}$ " ck; pumping	First production on southwest flank of dome
Needville	Ft. Bend	Dishman & Lucas	A. Hackstedt 1	Frio	4700-08	2,703,000 cu. ft. gas; $\frac{1}{4}$ " ck.	Extended gas area $1\frac{1}{4}$ miles northwest
Needville	Ft. Bend	British American	Hurta 3	Frio	5156-76	3,360,000 cu. ft. gas and 24 bbls oil; $\frac{1}{4}$ " ck.	Extended gas area $1\frac{1}{4}$ mile southwest
Needville	Ft. Bend	Goldston	Farmer 3	Miocene	3062-76	2,500,000 ft. gas; $\frac{1}{4}$ " ck.	New shallow gas sand
Needville	Ft. Bend	Goldston	Farmer 1	Frio	6288-92 6445-49 Dual	220 bbls; 10/64" ck & 144 bbls; $\frac{1}{4}$ " ck.	New sands, extended oil area 2150 ft. southwest
Sour Lake	Hardin	Sun	Merchant 1	Yegua	6335-65	132 bbls; $\frac{1}{4}$ " ck.	First commercial oil from Yegua in field
Humble	Harris	Sun	Bender 32	Yegua	5050-78	131 bbls; $\frac{1}{4}$ " ck.	First oil from Yegua on northwest flank
Lovell Lake	Jefferson	Humble	Jefferson Land C-1	Frio	7176-80	86 bbls; $\frac{1}{4}$ " ck.	First production on upthrown up dip side of fault
Fannett	Jefferson	Gulf	Craigen 1-A	Frio	6984-98	331 bbls; 11/64" ck.	Extended production $\frac{1}{4}$ mile east
Fannett	Jefferson	McCarthy	Burrell 1	Frio	7296-7302	433 bbls; 11/64" ck.	Extended production $\frac{1}{4}$ mile east—new sand
Stowell	Jefferson	Crown Central	J. Ehrlich 1	Frio	7841-55	19 bbls; 7/64" ck; Gr. 49.2"; R 31,500-1	New condensate sand
Stowell	Chambers	Gulf	Williams 2	Frio	7616-26 7571-81 Dual	303 bbls; 12/64" ck. 314 bbls; 12/64" ck.	New sands
Stowell	Jefferson	McCarthy	Trinity Pet. 1	Frio	8504-12	1,200,000 cu. ft. gas; $\frac{1}{4}$ " ck.	New sand
Stowell	Chambers	Sun-Gulf	S. Johns 1	Frio	7663-75 Dual	351 bbls; 12/64" ck.	New sands
Stowell North Markham	Chambers Matagorda	Sun	B. Green 1 Braman 9	Frio	7634-44 7624-34 8380-88	57 bbls; 0/64" ck. 350 bbls; 12/64" ck. Shut-in gas well	New sand
North Bay City	Matagorda	Sun	Braman B-2	Frio	8400-02	35 bbls; 75% oil; 9/64" ck.	New sand. Regular sand at 7834-40 ft. tested water
Pt. Neches	Orange	Texas Co.	Kuhn 19	Miocene	2288-2306	68 bbls; 9/64" ck.	New sand; 523 feet deeper than sand in B-1
Segno	Polk	Gulf	Wing 47	Yegua	5347-544	202 bbls; 4% salt water; 10/64" ck.	Six wells completed in 1944 in new Miocene sand
Livingston	Polk	Shell	Jones 2	Wilcox	6986-7012	146 bbls; $\frac{1}{4}$ " ck.	Extended production $\frac{1}{4}$ mile southwest
Livingston	Polk	Humble	Sodak 1	Sparta	6069-76	282 bbls; $\frac{1}{4}$ " ck.	New structural reservoir because of faulting
Livingston	Polk	Humble	Granbury 7	Wilcox	7005-20	490 bbls; 3/16" ck.	First well in Sparta on upthrown side of fault
North Louise	Wharton	Texas Co.	Bergstrom 1	Frio	4122-28	587,000 cu. ft. gas; $\frac{1}{4}$ " ck.	New structural reservoir because of faulting
Lissie	Wharton	Neilson	W. Poole 1	Yegua	6444-48, 6468-72 6602-06 Dual	3,000,000 cu. ft. gas; $\frac{1}{4}$ " ck. 2,250,000 cu. ft. gas; 3/16" ck.	Extended gas production 2 miles to south flank
							Extended gas production $\frac{1}{4}$ mile south

County, nor in the Mayes field, of Chambers County. Two dry tests near the discovery well and two more out some distance were drilled in the Spring field, of Harris County. A second well was completed at Beech Creek, of Hardin County, but it produced gas-condensate. A second test in the North Beech Creek field was dry and was completed as a salt-water disposal well for the discovery well. The second test in the Daboval field, of Wharton County, was dry and the third was dually completed as a gas-condensate and an oil well in sands different from the discovery well. In the South El Campo field the third and fourth tests were dually completed as oil and gas wells but the second, fifth, and sixth tests were dry. In the North Winnie field, of Chambers County, three gas-condensate wells were completed, the discovery well being the only oil well in the field at the end of the year. Four oil wells, including the discovery well, and a gas well were completed in the Smith's Point field. This field may have the best possibilities of the discoveries of 1944.

This review clearly indicates that the 1944 discoveries will add little to existing reserves.

EXTENSIONS AND NEW SANDS

Routine drilling in partially developed fields, with the resulting extensions, new sands, and new structural reservoirs were also the chief contributing factor to the increase in proved reserves. Much attention was given to prospecting the flanks of older fields and to exploring deeper formations in all areas. The more important extension wells and wells producing from new sands, together with important data, are listed in Table II. The fields in which they are located are shown on the map in Figure 1.

Brazos County.—A gas well was completed on the north flank of the Millican dome. Gas production had previously been established in one well on the south flank. An interesting deep test was drilling on the southeast flank at the close of the year. The well had passed through about 3,700 feet of salt overhang and will probably be drilled to the Lower Cretaceous.

Chambers County.—Twenty-nine completions in the Fig Ridge field aided in determining its faulted structure. The fault pattern of the Seabreeze field was further complicated by the completion of a gas-condensate well on the southeast flank.

Fort Bend County.—Production was discovered on the southwest flank of the Blue Ridge dome where nine oil wells were completed during the year. A new gas sand and a new oil sand were found in the Needville area. The gas producing area was extended considerably. Four oil wells and four gas wells were completed in the general Needville area, the relationships of which were not fully determined at the close of the year.

Harris County.—Production from sands of the Yegua was discovered in a new area on the northwest flank of the Humble field. However, three wells drilled in the immediate vicinity were dry. Ten oil wells were completed throughout the

field. The majority produced from Yegua sands on the southeast flank of the dome in an area which had been discovered in the previous year.

Jefferson County.—Production was discovered on the upthrown side of the main fault in the Lovell Lake field in 1944. Nine oil wells were completed in the main field on the downthrown downdip side of a strike fault. Two extensions were made in the *Marginulina*-Frio producing area on the east flank of the Fannette field. The first extended production $\frac{1}{2}$ mile east beyond previously established similar "pay" and the second extended production $\frac{3}{4}$ mile east beyond the first extension. Four new oil sands and one new gas-condensate sand were found in the Stowell field. Thirty-two wells were completed in this field during 1944. They aided materially in determining the complicated fault pattern of the field.

Matagorda County.—Six oil wells and one gas well were completed in the North Markham field. Production was extended to the west side of the Colorado River in the North Bay City field. The completion of ten wells gave this field its best year since discovery.

Polk County.—An extension well was completed on the southwest flank of the Segno field. Drilling resulting from this extension will aid in determining the fault pattern of the field. Three wells in the Livingston field opened new structural reservoirs. The field is considerably faulted. Thirteen oil wells were completed in the Wilcox and two in the Sparta sand.

Waller County.—The producing limits of the gas-condensate area, and especially of the oil area in the northern portion, were more closely defined in the Katy field. Ten oil and fifteen gas-condensate wells were completed throughout the field.

EXPLORATORY METHODS

Most of the exploratory tests in 1944 were drilled on subsurface prospects, the majority of which were localized by geophysical methods. Geophysical exploration has had its greatest success in the Upper Gulf Coast of Texas and is an indispensable aid in determining geologic structure. Seismic exploration in the district totaled 1421 crew-weeks, a decrease of 3.7 per cent from 1943. However, gravity exploration totaled 363 crew-weeks, an increase of 89.1 per cent, which was sufficient to bring the total of geophysical crew-weeks to 1784 or an increase of 7.0 per cent over 1943. The oil industry's evaluation of the various trends can be seen in a breakdown of geophysical crew-weeks in Table III.

TABLE III
DISTRIBUTION OF GEOPHYSICAL CREW-WEEKS
(Percentage)

Methods	Geologic Trends		
	Wilcox	Yegua	Marginulina-Frio
Seismic	44.1	16.7	39.2
Gravity	31.7	13.8	54.5
Total geophysical	41.6	16.1	42.3

NEW TRENDS

One new geologic trend, the Woodbine sand, was opened to exploration in the north-central part of the district. A well located in the extreme southwestern part of Houston County, 5 miles northeast of Midway, Madison County, found about 340 feet of Woodbine sand in a nearly solid body at an approximate depth of 8000 feet. Well developed Woodbine sand at this geographical position is considerably south of its previously known southern limits and although a dry hole the well caused a large lease play.

SUMMARY AND CONCLUSIONS

Wildcat wells and discoveries increased in number but the downward trend in quality of discoveries of the past few years continued in 1944. More oil was produced than was discovered. This increase in production, necessitated by the war emergency, seriously depleted the reserves. When additions to reserves are made chiefly by intensive exploration of known fields, the industry is in an unhealthy condition. Wildcatting is the only legitimate source of new reserves.

DEVELOPMENTS IN LOUISIANA GULF COAST IN 1944¹

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ABSTRACT

In 1944, 492 wells were drilled in Louisiana Gulf Coast, an increase of 144, or 41 per cent, over 1943. Of the total, 57 wells, or 11.6 per cent were wildcats, 13 of which, or 22.8 per cent, discovered new fields. Four hundred thirty-five wells were drilled in 103 of the district's 153 fields producing prior to 1944, and development wells had been drilled in seven of the 13 new fields by the close of the year. Eight fields formerly classified as gas or distillate fields became oil fields in 1944; 15 of the old fields were given major extensions; and important new sand discoveries were made in 24 additional fields. Three hundred thirty development wells were completed as producers and 105, or 24 per cent of the total, were abandoned.

Reflection-seismograph, subsurface geology, and gravity-meter work were the chief methods by which new fields, extensions, and new sands were found. Geophysical activity increased for South Louisiana during the year from an average of 33.5 crews working throughout 1943 to 38.67 in 1944. Reflection-seismograph crews increased from an average of 27 in 1943 to 32.78 in 1944 and only a total of 7 crew-weeks of torsion-balance work and 22 crew-weeks of refraction-seismograph work was done this year. Gravity crew-weeks decreased from an average of 6.5 for 1943 to 5.33 for 1944 and no appreciable exploration was carried out by core drilling, surface geology, or magnetometer. More acreage was taken under lease than in the preceding year with a slight increase in the average prices paid.

Development by the close of the year indicates that of the 13 newly discovered fields 6 may be expected to have reserves exceeding 10 million barrels, 3 may exceed 5 million, and the remaining 4 are inadequately developed to give an estimate of their size. While new fields have increased the reserves for South Louisiana, there has been a much greater increase from extensions, new sands, and new structural reservoirs in old producing fields. The age of the discovery sands are given in this paper according to the usage of the operators in each field.

The high proportion of field dry holes largely results from the very complicated nature of many of the structures in South Louisiana. Intricate faulting, extremely steep dips, or abrupt changes in stratigraphic conditions are common to most of the structures of this area. In addition, drilling hazards characteristic of South Louisiana are responsible for many dry holes. Among these are heaving shale, salt water flows, and great depths to which wells must be drilled. Forty-eight per cent of all the wells drilled were below 10,000 feet and 98 wells were drilled below 11,000 feet. Only a third of all the wells drilled were less than 9,000 feet deep and only 17 wells were drilled to depths less than 5,000 feet.

The geological significance of important wells in the area is discussed and the basis on which the discovery wells were drilled in 1944 is given where possible.

1944 NEW FIELDS

The first field discovered in South Louisiana in 1944 was *Gum Cove* with the completion of the Magnolia Petroleum Company's Moore No. 2 as a gas-condensate well, on February 20. The Moore No. 3, completed in June, added a new sand and discovered the first oil for the field, and one additional well was completed by the end of the year. The field is 4 miles east of Black Bayou salt dome in northwestern Cameron Parish and appears to be a faulted, deep-seated salt dome. The discovery sand at 9548 feet is in the *Marginulina howei* zone and the new oil sand, 160 feet lower, is in the *Camerina* zone. There are well developed sands above the discovery up to 9400 feet and additional drilling may reveal further accumulation of oil or gas in these sands.

The next field was discovered by the Superior Oil Company in Terrebonne

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Parish, where its Continental Land and Fur No. 1 was completed as a condensate well to establish the *Bayou Penchant* field, on March 5. The well was drilled to 11,828 feet and completed in a Miocene sand at 9929 feet. Shallower sands indicated the presence of gas. Bayou Penchant probably is a deep-seated salt dome.

Also in March, the Union Oil Company of California's Edgewood Land and Lumber Company No. 1 was brought in to establish the *Gordon* field, Beauregard Parish, as a gas-condensate reservoir. Three more wells were drilled in the field in 1944, one of which discovered a new sand and proved the first oil for the field. The structure is thought to be a low relief, fault-line type. The oil is produced from the *Marginulina howei* zone at 5319 feet, and the discovery sand at 6767 feet is in the updip equivalent of the Hackberry zone.

The *North Cankton* field, St. Landry Parish, followed in April, 2 miles northeast of the old Bosco production. The discovery sand in the Sun Oil Company's Boagni No. 1-B is in the *Marginulina texana* zone at 9667 feet, and multiple sands from 2800 feet in the Miocene to 10,100 feet in the *Nodosaria blaspiedi* zone indicate further gas or oil production. By the end of 1944 three oil wells and one gas well were completed with two producing sands added to the discovery. This is an old prospect with several deep tests made before 1944. Many years of reflection-seismograph exploration aided in defining the structure and, in addition, subsurface geology by the Humble, Sun, Shell, Pure, Superior, and other companies contributed much to the discovery of the field. The accumulation is on a gentle local closure on a regional uplift extending northeast from Bosco field with faulting playing a minor part in controlling the limits of production.

In May, the Continental Oil Company's Prairie No. 1 discovered *East Moss Lake* field in Calcasieu Parish. One development sand, topped at 10,397 feet, is in the *Cibicides hazzardi* zone, and a *Camerina* sand, at 9443 feet, is a potential distillate producer. The field is on a deep-seated structure with closure against the downthrown side of a major east-west fault. Subsurface geological studies of five wells drilled previous to the discovery justified detailed seismograph exploration which disclosed the presence of a favorable structure. These studies showed also that an old well, located on structure, was not drilled deep enough to encounter the objective sands. This history led to the drilling of the discovery well.

Twelve wildcat tests had been drilled on the *Bayou des Glaisses* piercement salt dome, Iberville Parish, after the discovery of salt in 1929 before the Humble Oil and Refining Company found first commercial production in May, 1944. The presence of oil had been indicated in the early drilling, but no commercial accumulation was proved until the company's Wilberts No. 4-B was completed. This well was drilled on the north flank of the dome and produces from a sand at 9800 feet in the *Marginulina texana* zone. A total of 79 net feet of oil saturation was found in the discovery well and the band of production, although prolific, probably will be narrow and difficult to follow.

Two months later in the same parish, the Humble's Hymel No. 1 discovered the *Laurel Ridge* field which may develop into an important gas-condensate and

possibly an oil field. The first well drilled on the prospect was dry and structurally 600 feet lower than the discovery well located 9000 feet at the north. A third well, completed in November and 6000 feet southwest of the discovery, was 77 feet higher and had a total of 46 feet of saturation in the discovery sand. Additional wells will be needed to evaluate this field, which appears to be a faulted, deep-seated salt dome. Production is in the transition zone between the *Heterostegina* and *Marginulina idiomorpha*.

Also in July, the Humble discovered the *College Point* field in St. James Parish with gas production in the Keller No. 1. No additional wells were drilled in 1944; the structure probably is a deep-seated salt dome. The producing sand is in the *Discorbis* zone.

The Pure Oil Company's General American Transportation No. 1 discovered the *Good Hope* field, St. Charles Parish, on August 14. A second well, completed in December, extended the field 1900 feet southwest and found the discovery sand 36 feet higher. The structure, probably a deep-seated salt dome, was found by the Shell Oil Company, Inc., and the Pure Oil Company through reflection-seismograph exploration. The discovery sand occurs at 7830 feet in the Miocene and at 10,171 feet the well was in the *Marginulina ascensionensis* zone where drilling was stopped as the result of a strong salt water flow. This discovery gives promise of being a good field. The Pure, Shell, and Humble companies are the principal leaseholders.

Of major importance is the *West Tepetate* field, eastern Jefferson Davis Parish, discovered by Barnsdall, Vincent and Welch in October. Their Miller No. 1 contained approximately 90 net feet of oil sand and 60 net feet of gas-condensate saturation in 8 separate sands of the *Cibicides hazzardi* zone from 8300-9300 feet and *Marginulina vaginata* zone at 7730 feet. The structure appears to be a gentle closure on the low south side of an east-west trending fault with the closure separated from the Tepetate field by a structural saddle. The area was first localized by Vincent and Welch with torsion-balance work. Subsurface study followed, but the chief exploratory work that led to the discovery was by intensive reflection seismograph. Faulting does not appear to play an important part in controlling accumulation.

The *South Lake Charles* field, Calcasieu Parish, discovered by the Continental Oil Company's Greathouse No. 1 in October, is a deep-seated dome with considerable faulting. The discovery sand at 10,018 feet is in the *Camerina* zone. The importance of this field will not be determined until further development has taken place. The prospect was originally discovered by torsion-balance exploration by Shell and three wells were drilled prior to the discovery well. Subsurface information indicated the need for further exploration, especially in that potential oil-producing sands had not yet been reached. Reflection-seismograph prospecting, based on this subsurface work, was responsible for the discovery of the field.

The *Indian Village* field, in Jefferson Davis Parish, was discovered also by the Continental in October. The King Corporation No. 1 was completed in a

sand at 7135 feet in the *Cibicides hazzardi* zone. The productive area is probably small. The structure is a Tepetate type and was discovered as the result of detailed seismograph exploration and subsurface studies. Two wells had been drilled on the prospect previous to the discovery, but these did not afford sufficient information to be considered an important factor in reaching a decision for drilling.

The last field to be discovered in 1944 was *Houma*, Terrebonne Parish, where the Union Oil Company of California completed the Gaidry No. 1 on Christmas day. The well was drilled to 12,618 feet and completed as a gas-condensate well in a Miocene sand at 10,290 feet. The structure probably is a deep-seated salt dome.

FIRST OIL PRODUCTION IN OLD GAS FIELDS

As the result of 1944 drilling in South Louisiana, eight fields formerly classified as gas, distillate, or condensate fields became oil fields. In addition, two of the newly discovered fields for 1944 had their first oil production in wells drilled after the discoveries. These are *Gordon* and *Gum Cove*, both of which produced gas-condensate in the discovery wells.

Of the eight newly classified oil fields, three, *Egan*, *North Tepetate*, and *Bully Camp*, also established major extensions for the productive areas. Of considerable importance was the Sun Oil Company's Freeland No. 1 which found oil in the discovery sand of the *Egan* field, a 1943 gas-condensate discovery in southwest Acadia Parish. The sand occurs at 10,740 feet in the *Cibicides hazzardi* zone and the well is located 9000 feet northeast of the discovery. If no faulting exists between the two wells, the vertical gas-oil column may be as much as 300 feet and a large development area is opened.

In the *North Tepetate* field, near the northwest corner of Acadia Parish, gas-distillate production had been discovered by the Atlantic Refining Company's Klumpp No. 1 in 1938. Additional reflection-seismograph exploration and subsurface geologic interpretation by the Humble led to a major extension 3000 feet south in the Vincent No. 1. In addition to finding oil in the 7840-foot sand, this well encountered all of the field's known gas-condensate sands, and indicated the presence of other oil and new distillate sands. This extension indicates an additional reserve equal to, or greater than, that previously estimated from these *Cibicides hazzardi* zone sands. The structure is a large gentle Tepetate type, probably bounded north and south by major faults, and elongate east-west.

The *Bully Camp* field, LaFourche Parish, produced its first oil this year in approximately 150 feet of oil-saturated Miocene sands between 6390 and 6610 feet. The Gulf Refining Company's Delta Securities No. 6 not only proved the first oil production, but extended the field on the northwest flank of the dome. This production may be limited by faulting and may not extend entirely around the dome. There are, however, numerous potential reservoirs in the Miocene sands above and below the present producing depth and this field probably will develop into one of the better piercement salt-dome fields of the Louisiana Gulf Coast.

The production of oil at 11,085 feet in the Union Sulphur Company's Gueno No. 3 was the first oil for the *Branch* field, Acadia Parish. The 1943 discovery well blew out from a gas-distillate sand 500 feet higher in the section and the Gueno No. 3 was drilled to the total depth of 11,316 feet revealing a sand section approximately 150 feet thick with gas and oil accumulation in the top 55 feet. This oil production is from the Hackberry zone.

The Gulf Refining Company's Haas and Hirsch No. 1-E established the first oil production at the *Krotz Springs* field, St. Landry Parish. A 10-13-foot oil column is present below gas in the 9300-foot sand nearly 800 feet above the top of the Jackson formation. This field is still undeveloped and faulting plays a major role in controlling the extent of the reservoirs. With a water contact present in the oil sand and the complicated faulted structure this discovery may not be of major importance.

The Phillips Petroleum Company's Adelaide No. 1 was completed as an oil well in a sand at 7380 feet in the *Erath* field, Vermilion Parish. Although it had been known previously that there were shallow oil sands in this field, all production prior to 1944 had been gas-condensate. Two shallow oil sands are now productive and an extra 5 to 10 million barrels of oil should be recovered in addition to the 93,000,000-barrel condensate reserve.

The first oil for the *West White Lake* field, Vermilion Parish, was discovered in the Union Oil Company of California's State No. 2-A. Production at 10,684 feet is in the Miocene.

The gas-distillate *Belle Isle* field, St. Mary Parish, produced its first oil in the Sun Oil Company's Belle Isle Corporation No. 5, completed in a new shallow sand at 5035 feet. A second well drilled in 1944, the Belle Isle No. 7, was completed as an oil well in a new sand at 8248 feet.

In addition to these fields, mention should be made of the California Oil Company's K. F. Vail No. 3 in the *Delta Farms* field, LaFourche Parish. The 9350- and 9400-foot sands not only extended production limits, but also opened new oil reservoirs in sands previously known to contain only gas. The field, however, has other oil sands which produced prior to 1944.

MAJOR FIELD EXTENSIONS OF 1944

It is difficult to determine arbitrarily which wells are to be considered as field extensions on structures in South Louisiana, where many wells drilled as development wells are actually semi-wildcats due to the complexity of structure and stratigraphy accompanying both piercement salt domes and the highly faulted structures of deep-seated origin. Therefore only the major extensions are discussed here. Fifteen fields discovered prior to 1944 were so enlarged.

One of the most important of these is the *Delta Duck Club* field located near the mouth of the Mississippi River, in Plaquemines Parish. The Texas Company's Delta Duck Club No. 3, a 4000-foot west extension for the field, encountered a total of approximately 270 net feet of oil sand plus 100 feet of additional oil or

gas saturation in twelve separate zones between 3850 and 10,150 feet. This appears to be a faulted salt-dome structure and possibly between 20 and 35 million barrels of new oil will be realized from this extension.

The *Starks* field, Calcasieu Parish, was one of the more actively explored fields of the state in 1944 with six dry holes, two oil wells, and two condensate wells drilled. W. T. Burton's Lutch-Moore No. 10 discovered oil in a new sand at 8046 feet in the Hackberry zone far out on the northwest flank of the old dome. The 70-foot oil column in this sand should add at least 10 million barrels of new oil to the field.

A 40-foot oil column has been discovered beneath gas on the west side of the *Bateman Lake* field, St. Mary Parish, in The Texas Company's Wax Bayou No. 7. This sand, at 10,022 feet, is Miocene in age and was found during a development program prior to the completion of a recycling plant for the field, which is essentially a gas-condensate field. This oil is a rim occurrence on the west side of the field in a sand which formerly was known to contain only gas. A water contact penetrated below the oil will affect the production limits, but 300 to 500 acres should be productive of oil and increase the reserves from 5 to 10 million barrels.

Production at *Delta Farms*, already referred to, has been extended on the north side of a major east-west trending fault and seven wells have been completed in this new upthrown segment. Drilling by the close of the year had not defined the northeast or west limits of production.

Gulf found oil in a new deep sand on the northeast flank of the *Section 28* salt-dome field, central St. Martin Parish. The zone was broken and most of it shaley, but saturation was found in all sands between 10,870 and 11,170 feet, and an estimate of approximately 3 million barrels of reserve could easily grow should future drilling disclose better developed sands. Production probably will be limited, however, to a narrow belt characteristic of piercement salt domes and the peripheral extent of production may be limited by faulting.

The *Bastian Bay* field in southern Plaquemines Parish, between the Venice and Lake Washington salt domes, was extended approximately 2 miles westward in March by the Phillips Petroleum Company's Easterling No. 3. Since then, two dry holes have been drilled between the new producer and the older section of the field and two separate areas are now producing. The extension well contained 35 net feet of oil sand at 9115 feet, but because of considerable faulting the new producing segment may be limited in size.

The extensions at the *Egan*, *North Tepetate*, and *Bully Camp* fields have already been discussed with their associated new oil production. In the *St. Martinville* field, St. Martin Parish, the contributing factor that led to the drilling of the Continental Oil Company's Standard of Kansas Fee No. 2 was the possibility of deeper flank production on a known dome. Seismograph work supported the idea and aided in selecting the drill site. A considerable number of wells had been drilled higher on the dome and of these only two were productive. The extension well produces from a thick sand section at 9632 feet in the *Discorbis* zone.

A north extension was added to the *South Crowley* field, Acadia Parish, by the Phillips Petroleum Company's Onezime No. 1, where production was obtained in the *Heterostegina* zone at 9738 feet. Development has not been such, however, as to indicate this as a large reservoir.

The *Lewisburg* field was extended south from St. Landry Parish into Acadia Parish in the Amerada Petroleum Corporation's Daigle No. 1-F. Production in this field is controlled by closures against major faults and the extent of this new producing area is unknown at present. Markley-Crosby's Baist Cooperage No. 9 extended the *Bayou Blue* field, Iberville Parish, approximately $1\frac{1}{2}$ miles north and was completed in a new sand at 7400 feet. At the *Port Barre* field, St. Landry Parish, The Texas Company extended production southeast in the Botany Bay No. 34. This well was drilled in search for new deep flank production to a total depth of 8756 feet, but was completed in a sand at 7735 feet, below which the section was essentially shale. A 2-mile north extension was given the *Bay Ste. Elaine* field, Terrebonne Parish, by The Texas Company's Bay Ste. Elaine No. 1. Production was established in a new Miocene sand at 10,180 feet.

NEW SANDS IN 1944

Many of the additions to the state's reserves for 1944 came from new sands encountered in old fields and some in the fields discovered this year. Approximately 35 fields were so enlarged, of which some of the important extensions not already discussed were in the following fields: Lockport, East Hackberry, Pecan Lake, Avery Island, Rosedale, Potash, West Bay, Paradis, Hester, Vacherie, Pine Prairie, West Gueydan, Leeville, Gibson, and West Lake Verret.

IMPORTANT CONTRIBUTIONS TO GEOLOGICAL KNOWLEDGE

In 1944, as in many years past, credit for new discoveries has been given to reflection-seismograph exploration as the most important method by which new fields have been located. Without minimizing the emphasis that should be placed on geophysical prospecting, one should recognize that, basically, data obtained in seismograph work is essentially but one tool to be used by the subsurface geologist. Structural information gained by geophysics must be coordinated with a vast amount of stratigraphic and lithologic knowledge in order to understand the relative importance of structures as drilling sites. Geological information in South Louisiana is obtained almost entirely from data available in the drilling of wells and such knowledge aids in determining the proper depths for objective horizons and the possible returns to be anticipated in searching for new oil in old producing areas.

In this light nearly every well contributes important subsurface data needed in developing fields and in wildcatting. This is true in South Louisiana, in particular, because of the great complexity of oil-field structures associated with the salt domes and the abrupt changes found in stratigraphic conditions. A few wells should be singled out from the 1944 drilling as examples, as they have contrib-

uted important data useful in projecting exploratory programs in the future.

In the *Gillis-English Bayou* area the Continental Oil Company drilled the Mrs. Ida Wassey No. 1 in search for deeper flank production. Although no productive sands were found in this well, the drilling did bring to light the presence of well developed sands in the Hackberry zone. These sands were unknown this far downdip prior to the drilling of this well and the fact that good sand sections may occur in this zone at this depth will have an important bearing on future deeper exploration in southwestern Louisiana Gulf Coast area.

Another example of the same type came 2 weeks later when the Union Sulphur Company completed the Gueno No. 3 in the *Branch* field, Acadia Parish. This well was drilled to 11,315 feet with no *Nodosaria blani* present. *Cibicides hazzardi* was found at 9786 feet and *Bolivina mexicana* at 10,628 feet, but it is not known if the Chickasawhay zone was penetrated because the fibrous material in the mud made it impossible to use a shale shaker and cuttings were poor. It is thought, however, by correlation, that the good development of sand at 11,100 feet is in the Hackberry zone. This knowledge should apply to future exploration in downdip Hackberry as in the case of the Gillis well.

The wells drilled in the *Krotz Springs* field, St. Landry Parish in 1944, were important in regard to the stratigraphic knowledge they contributed. Production was established in the Cockfield by the Humble's Prince No. 1 and showings of oil in cores below 12,273 feet indicated Wilcox saturation in the Gulf's Haas and Hirsch No. 1-E. A productive Cockfield sand at 10,050 feet was encountered in the Gulf's Haas and Hirsch No. 2-E, and sands thought to be Sparta in age were present also in this well. The presence of sands and saturation in the Cockfield, Sparta, and Wilcox at this depth was new information gained this year.

This knowledge already has been applied in searching for flank production at the *Port Barre* field, St. Landry Parish, where The Texas Company drilled the Botany Bay No. 34 in search for these Cockfield and Sparta sands. As the well drilled into salt before reaching the Cockfield, the next well, the Botany Bay No. 35 was located farther out on the flank of the dome. Drilling was stopped at 11,705 feet near the base of the Sparta which was represented by a 335-foot limestone section at 11,350 feet, below which a Sparta sand had a strong salt-water flow. No Cockfield sand was encountered in this well; therefore, it may be inferred either that Cockfield sand development at Krotz Springs was a local occurrence or that the Port Barre well was too high on the flank of the dome and any Cockfield sands were pinched out in the shale. An extension of downdip Sparta sands, however, was established by this well. The search for deep Wilcox sands may be expected in this and other fields along this trend in the future.

Another example of this type of subsurface thinking may be found in referring the Lewisburg field production to the development at *North Cankton*. A good Hackberry sand at 10,600 feet in the Stanolind Oil and Gas Company's Dohmann No. 1 has not been found downdip and may be expected to be present at North Cankton. In the light of these deep downdip sand occurrences this

Dohmann sand may be considered as an objective in exploring for deeper production at North Cankton and other fields on that strike.

There are several salt domes in South Louisiana on which no oil or gas has been found to date although exploration continues in search for production. One of these is the *Calcasieu Lake* dome on which, it is of interest to note, the Continental's State-Lake Calcasieu No. 1 penetrated 281 feet of cap rock material and was still in it at the total depth of 7802 feet in this flank test.

At *Avery Island*, Iberia Parish, more than 500 net feet of saturated sand was encountered in the Humble's Petit Anse No. 1-B between 8600 and 9800 feet on the west side of this piercement-type salt dome. There is little doubt that such a thick sand development and oil column at this depth, located on the flank of a piercement salt dome, will influence the future exploration of the flanks of other domes of the same type in South Louisiana. Some leasing in 1944 has already given indication of the application of geological thinking along this line.

One other well deserves mention, the Union Producing Company's Buckley-Bourg No. 2 in the *DeLarge* field, Terrebonne Parish. This well was drilled to the total depth of 13,588 feet and established a world's record depth for oil production in August, 1944. A 19-foot oil sand producing 35° gravity oil was found at 13,497 feet, and although this is not a major extension, the fact that low-gravity, dark-colored oil is being produced at this great depth is noteworthy.

From a paleontological standpoint much could be said about information received from wildcats and field wells drilled in South Louisiana in 1944. It should be recalled that in this area geologists are dealing with lithologic conditions and formations not present on the surface, and in the early phases of exploratory knowledge the subdivision of the thick Miocene and Oligocene sections into faunal zones or formations is a real problem. The selection of faunal assemblages in each small area must be coordinated with similar data in other areas and lithological changes and stratigraphic conditions noted. Gradually the pattern reveals itself to such an extent that agreement is generally reached about the top and bottom limits of these zones. The major problem of recognizing formation boundaries that can be used from one area to another and fit into correct observations of thin updip sections and thick downdip developments is constantly facing paleontologists and geologists of South Louisiana. Without going into details, it may be stated that many of the wells drilled throughout this district contributed much valuable information which will serve to clarify these problems, particularly in reference to subdividing the Miocene, a research which is still in its infancy. Faunal data from wells drilled from the Florida parishes on the east across the state to Beauregard Parish encourage those working on these problems and some satisfactory basis for subdividing the Miocene may be anticipated.

GENERAL

The map accompanying this paper shows the location of all the fields discussed. The general activity in the district is shown by two fractions beneath the

parish names by which the ratio of discovery wells to total number of wildcats is given and the ratio of the number of field producers to total number of field wells drilled is shown. Three hundred forty-three of the total of 492 wells drilled were completed as oil or gas wells; this is 69.7 per cent with 30.3 per cent abandoned. Measured by these ratios, drilling was most successful in Jefferson Davis and St. Charles parishes, each with two discovery wells and no dry hole wildcats and each with only one dry field well. More wells were drilled in Calcasieu Parish than any other, largely the result of the development stage of Vinton field in which 35 wells were drilled. Other fields particularly active this year were Neale, Starks, Pine Prairie, Delta Farms, Bayou Sale, and Erath. It may be pointed out also, that in seven of the parishes of the district in which no production has yet been found, there were no wildcats drilled. In Tangipahoa and Livingston parishes, with no fields discovered, there were two wildcats drilled each. In general, the Florida parishes and those bordering south and central Louisiana remain relatively inactive from the standpoint of exploration.

DEVELOPMENTS IN SOUTH ARKANSAS AND NORTH LOUISIANA IN 1944¹

R. M. WILSON²

ABSTRACT

Drilling activity in South Arkansas and North Louisiana during the year 1944 showed a 10 per cent decrease as compared with 1943. This decrease was occasioned mostly because of deeper drilling in the area and the development of gas and gas distillate fields. Of the 126 wells drilled as wildcats, 17 discoveries were made classified as follows: 10 new fields, 2 extensions to old fields, and 5 new producing formations in old fields. During 1943 a total of 141 wells were drilled as wildcats, resulting in 12 discoveries. Just what effect these new discoveries will have on the future reserve picture of the area can not be foretold at this time. The total production for the area was about 3½ per cent less than in 1943. Geophysics led again this year as the chief exploratory method in discovering new fields.

INTRODUCTION

This paper reviews the developments and drilling activities in the Shreveport district of the American Association of Petroleum Geologists, which comprises those parishes in northern Louisiana north of an east and west line along the southern boundaries of Rapides, Vernon, and Avoyelles parishes, and the state of Arkansas. The majority of the wells drilled in Arkansas during the year were located in the southern part.

North Louisiana is credited with 12 new oil or distillate, and 2 gas discoveries, while Arkansas has 3 which open new oil reserves for that state.

DEVELOPMENT

This area experienced a 10 per cent decrease in drilling activity over the year 1943. This was occasioned mostly because of deeper drilling, and the development of gas and gas-distillate fields. As an aid in the conservation of vital war materials, it has been the practice during the past 2 years to develop gas and gas-distillate fields on a wide-spacing plan. Table I provides a break-down and comparison of drilling activities for the states of Arkansas and Louisiana during the years 1943 and 1944.

TABLE I
COMPARATIVE DRILLING ACTIVITIES FOR YEARS 1943 AND 1944

	Arkansas 1943	North Louisiana 1943	Arkansas 1944	North Louisiana 1944	Total Arkansas and Louisiana 1943	Total Arkansas and Louisiana 1944
Oil or distillate wells drilled in fields	133	128	126	110	261	236
Gas wells drilled in fields	17	66	2	67	83	69
Dry holes drilled in fields	30	59	25	74	109	9
Oil or distillate wells wildcat discoveries	4	5	3	12	9	15
Gas wells wildcat discoveries	1	2	0	2	3	1
Dry holes drilled as wildcats	64	77	61	65	141	126
Total	269	337	217	330	606	547

¹ Manuscript received, March 24, 1945.

² Ohio Oil Company.

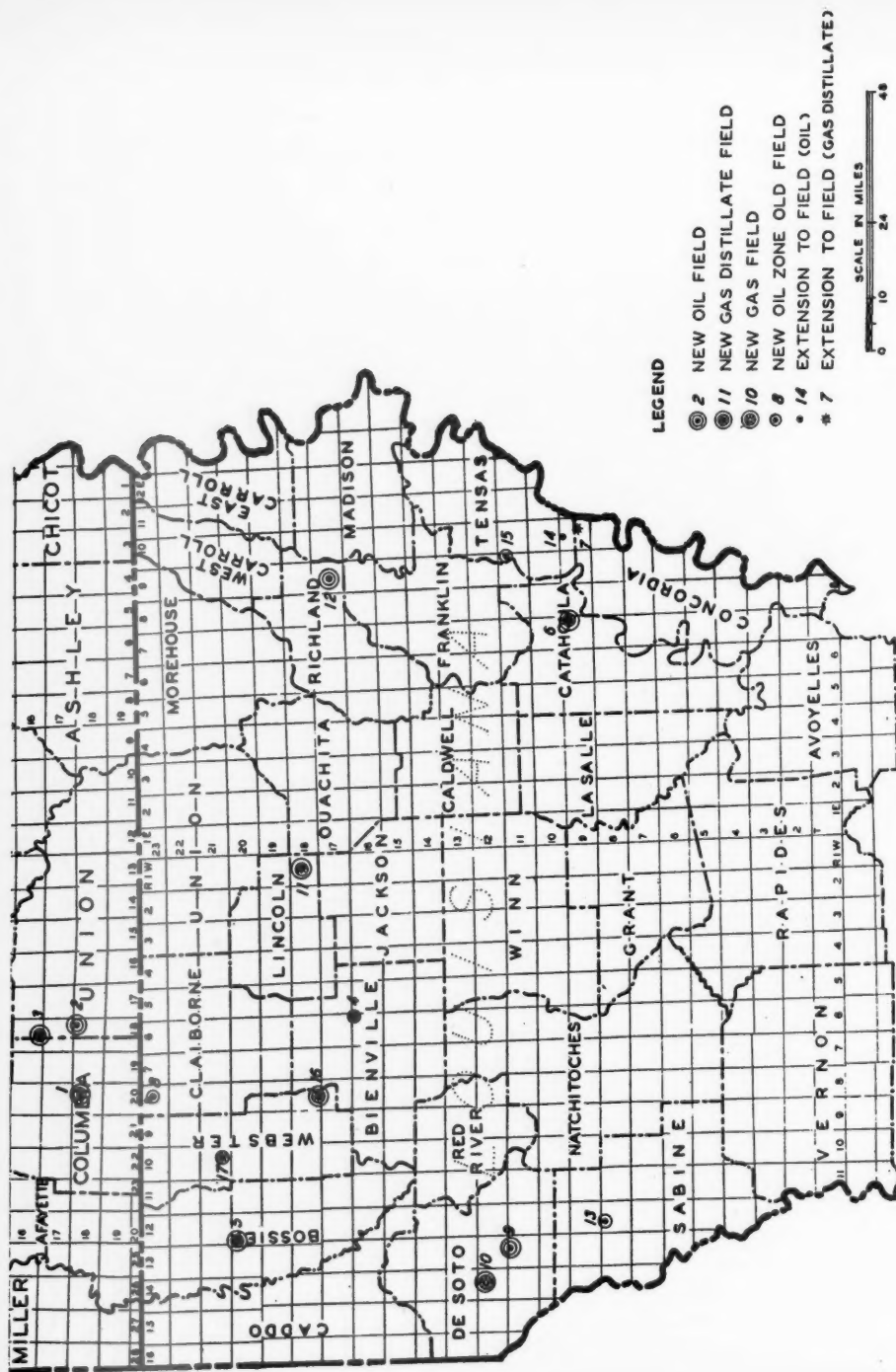


FIG. 1

TABLE II
ARKANSAS DISCOVERIES AND EXTENSIONS FOR YEAR 1944

Farm and Well No.	County Parish	Location		Depth of Producing Zone (ft.)	Producing Formation	Initial Production	Date Completed	Reason for Drilling	Remarks	Field Name	Number Wells Producing Jan. 1, 1945
		4 Sec.	Sec. T. R.								
LOUISIANA DISCOVERIES AND EXTENSIONS FOR YEAR 1944											
1 Tide Water & Pearce 1	Columbia	NE NW	10-18S-20W	8,298	Smo. Lime	32 BPD (oil)	3- 1-44	Seismograph	Discov.	Calhoun	3
2 Seaboard	Union	NW SW	2-18S-18W	7,942	Smo. Lime	100 BPD (oil)	2- 5-44	Seismograph	Discov.	Wilkes	1
3 Atlantic Refg. Co. 3 at Ref. C-106	Union	SW NW	33-16S-18W	7,091	Smo. Lime	99 BPD (dst)	6-29-44	Seismograph	Discov.	Salem Church	2
LOUISIANA DISCOVERIES AND EXTENSIONS FOR YEAR 1944											
4 Southern Prod. Co.	Bienville	Cent. Sec.	1-16N- 6W	7,443	Lower Pet.	63 BPD (dst)	9- 1-44	Deep test in old field.	New prod. form.	Bear Creek	2
5 Barnsdall Oil Co.	Bossier	SW NE	7-20N-12W	8,762	Cot. Val.	164 BPD (dst)	10-31-44	Seismograph	Discov.	Benton	1
6 Calif. Co.	Catahoula	SW SW	12-0N-7E	8,377	Tuscaloosa	23 BPD (dst)	12-14-44	Seismograph	Discov.	Sicily Is.	1
7 Calif. Co.	Concordia	NW NW	4-9N-10E	9,068-9,091	Tuscaloosa	210 BPD (dst)	1-27-44	Seismograph Extension	Discov.	St. John Lake	11
8 Ohio Oil Co.	Claiborne	Cent. Sec.	15-23N-8W	8,835-8,920	Cotton Val.	377 BPD (oil)	11-17-44	Deep test in old field	New prod. form.	Haynesville	1
9 J. A. Johnson Guy 1	DeSoto	SW NE	3-11N-13W	2,728-2,732	Paluxy	18 BPD (oil)	10-15-44	Subsurface	Discov.	Trenton	1
10 A. W. Phillips Anthony A-1	DeSoto	SE NE	9-11N-14W	4,863-4,883	Rodessa	75 MMCF/PD	8-26-44	Subs. & Seis.	Discov.	Spider	3
11 Calif. Co.	Lincoln	NW NE	15-18N-1W	9,400	Cotton Val.	97 BPD (dst)	10-28-44	Seismograph	Discov.	Tennant	1
12 C. H. Murphy J. E. Holt 1	Richland	NE SW	21-17N-9E	3,173-3,201	Paluxy	218 BPD (oil)	12- 9-44	Seismograph	Discov.	DeHill	1
13 A. R. Chestnut	Sabine	SW SW	4-8N-13W	3,240-3,250	Paluxy	16 BPD (oil)	12- 8-44	Subsurface	New prod. form.	Converse	1
14 Calif. Co.	Texas	NW SW	46-6N-10E	9,028-9,098	Tuscaloosa	325 BPD (oil)	3- 3-44	Seismograph	Extension	Lake St. John	1
15 Chicago Mill & Lbr. Co.	Mutual 1	NE SE	12-11N-9E	3,012-3,024	Wilcox	90 BPD (oil)	2- 4-44	Subsurface	New prod. form.	Italy Ridge	1
16 Carter Oil Co.	N. P. Davis 1	NE NE	33-18N-8W	5,405-5,520	Rodessa	12.5 MMCF/PD	10- 1-44	Seismograph	Discov.	Ada	1
17 Cotton Valley Oper. Com.	Webster Gray 1	Webster Cent.	26-21N-10W	10,651-10,681	Cotton Val.	120 BPD (dst)	6-26-44	Subsurface	New prod. form.	Cotton Valley	1

Abbreviated: BPD, barrels per day; dst, distillate; MMCF, million cubic feet.

Sixty-four wildcats were drilled in South Arkansas, and 79 in North Louisiana during the year. The following table classifies the discoveries for each state.

State	New Oil Field	New Gas Field	New Dist. Field	Ext. to Field	New Prod. Zone Old Field
South Arkansas	3				
North Louisiana	2	2	3	2	5
Totals	5	2	3	2	5

To date most of the new reservoirs have not been developed beyond the discovery well. For that reason it is difficult to foretell how much the future reserves of the area will be increased.

The following tabulation provides a comparison of the gross oil production in barrels by states for the years 1943 and 1944.

State	1943	1944
North Louisiana	30,348,835	26,569,565
South Arkansas	27,495,925	29,312,020
Totals	57,844,760	55,881,585

The area as a whole showed a decline in production of approximately $3\frac{1}{2}$ per cent.

Table II lists the new discovery wells and pertinent data relative to them.

NEW FIELDS

Three new fields, two oil and one gas distillate, were discovered in Arkansas during the year 1944. These fields are: *Calhoun*, *Wilkes*, and *Salem Church*. To date there are three wells in the Calhoun field, one in the Wilkes field, and two in the Salem Church field. The data at hand do not indicate that any of these will develop into a major field.

There were seven new fields discovered in North Louisiana during the year namely, *Benton*, *Sicily Island*, and *Tremont*, uncovering new gas-distillate reserves, while *Spider*, and *Ada*, will be gas fields, and *Trenton* and *Delhi* are oil fields. Of these new discoveries probably Benton, Tremont, and Delhi are the most important.

Benton (Bossier Parish, Louisiana).—After doing extensive seismograph work in this area, the Barnsdall Oil Company drilled the J. T. Hanks well No. 1. This well was completed, October 31, 1944, and flowed initially 164 barrels of 61° gravity distillate from perforations between 8002 and 8036 feet. This production is from the "D" sand of the Cotton Valley formation.

The well was drilled to the total depth of 8762 feet. A total of 1122 feet of the Cotton Valley formation was penetrated. The Bodcaw sand of the Cotton Valley formation was perforated between 8114 and 8150 feet. On test, the sand produced at a rate of 120 barrels of distillate daily, with gas-oil ratio of 29,500 to 1. A cement retainer was set at 8052 feet and the well was completed in the "D" sand.

The field is located approximately 15 miles southeast of the Pine Island field

in Caddo Parish, 12 miles northwest of the Bellevue field in Bossier Parish, and 15 miles S. 75° W. of the Cotton Valley field in Webster Parish.

The well is important as an exploratory success in that it marks a new westward extension of the "D" and Bodcaw sands. The type locality of these sands is in the Cotton Valley field.

Tremont (Lincoln Parish, Louisiana).—This field, named for the village of Tremont, located in the southeast corner of Lincoln Parish, is approximately 11 miles east of Ruston, the Parish seat, and 20 miles west of Monroe, Parish seat of Ouachita. The discovery well, The California Company's J. M. Norris No. 1, was drilled to the total depth of 9768, bottoming in the Cotton Valley formation. The well was completed, October 28, 1944, through casing perforations between depths of 9060 and 9080 feet, and on initial test produced at the rate of 97 barrels of 49.4° gravity distillate through $\frac{3}{4}$ -inch tubing choke per day with a gas-oil ratio of 23,041 to 1.

The production is from a sand in the upper Cotton Valley formation. The correlation of this sand is debatable, but it occupies about the same stratigraphic position as the "C" or "D" sand in the Cotton Valley field. This well is important in that it marks an eastward extension of development of, and production from, sands of Cotton Valley age in this stratigraphic position.

No data are available to estimate the areal extent of this field, or its importance to the future reserves of the district.

Delhi (Richland Parish, Louisiana).—This field is located approximately 3 miles southwest of the town of Delhi in southeast Richland Parish.

Seismograph work in the area led to the drilling of the discovery well, C. H. Murphy Jr. and Sun Oil Company's J. E. Holt No. 1. The well was drilled to the total depth of 3425 feet, and produced initially 218 barrels of 38.1° gravity oil with a gas-oil ratio of 404 to 1, through 12/64-inch tubing choke per day, from casing perforations between 3273 and 3291 feet.

The well is thought to have been bottomed in the Paluxy formation of Trinity age. Gas was encountered between 3200 and 3232 feet in a tuffaceous sand and chert gravel section of probable Tuscaloosa age. Above this conglomerate bed a thin section of Upper Cretaceous glauconitic chalks was encountered, and below it a 38-foot section of non-marine, non-fossiliferous red shale. This shale overlies a clean fine- to medium-grained oil sand, the "Holt" producing sand of the discovery well. Underlying the Holt sand are 105 feet of red shales with *Charaphytes* resting on 15 feet of clean fine- to medium-grained sand, saturated with salt water. The age of the tuffaceous sand and gravel section, the red shale intervening between the bed of conglomerate, and the Holt sand, and the Holt sand is debatable. No data are available at this time to ascertain the true age relationship of these beds, or their areal extent in the subsurface. Whether or not a major field will develop is uncertain. The speculation of production from sands near their truncated edges as may be inferred from such a stratigraphic sequence has led to a most extensive leasing campaign in this part of North Louisiana.

NEW PRODUCING ZONES, SANDS, AND FORMATIONS

Deeper drilling in five old fields in North Louisiana resulted in the discovery of deeper producing formations. Table II lists these discoveries with pertinent data relative to each.

Cotton Valley field (Webster Parish, Louisiana).—The Cotton Valley Operators Committee's Gray No. 1, a proposed Smackover limestone test for this field was completed, June 26, 1944, after drilling to a total depth of 10,681 feet. The well was completed from open-hole between 10,651 and 10,681 feet, and produced initially at the rate of 120 barrels of 70° gravity distillate, and 6 million cubic feet of gas daily through $\frac{3}{8}$ -inch tubing choke. The production is from a sand of early Cotton Valley age.

Drilling operations were stopped before the Smackover limestone formation, the objective for the well, was reached. The apparent abnormally high pressures in the basal sands of the Cotton Valley formation created physical hazards too great to risk drilling the well deeper. Tubing pressures up to 5000 pounds per square inch have been measured at the well-head, but to date the well has not been closed in long enough to ascertain the true rock pressure.

The well potential from this new sand is not large, but the presence of a productive zone deeper in the Cotton Valley formation is hoped for the area.

Haynesville (Claiborne Parish, Louisiana).—The discovery of a new oil zone in the Cotton Valley formation was an important contribution to the year's activities. The Ohio Oil Company and the Gulf Refining Company's G. W. Taylor Acct. No. 5H, through casing perforations between 8835 and 8875, and 8910 and 8920 feet, on initial test flowed at the rate of 377 barrels of 43.8° gravity oil through 18/64-inch tubing choke per day. This production is from a sand and gravel section in the Shongaloo³ member of the Schuler formation of Cotton Valley age. Heretofore the deeper Cotton Valley sands in North Louisiana have yielded only gas and gas distillate.

EXTENSIONS TO KNOWN FIELDS

Two wells are listed in Table II as extensions to the Lake St. John field in Concordia and Tensas parishes, Louisiana. First, The California Company's F. D. Brown No. 1 extended gas-distillate production from the Tuscaloosa formation approximately one mile northeast. Second, the same company found oil in the J. W. Brown No. 1, more than 3 miles north and a little east of the discovery well in the field. The oil is produced from the Tuscaloosa formation.

IMPORTANT WILDCATS

Important wildcat wells and dry holes completed in South Arkansas and North Louisiana during the year with pertinent data relative to each are listed in Table III.

³ F. M. Swain, "Stratigraphy of Cotton Valley Beds of the Northern Gulf Coastal Plain," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 28 (1944), p. 600.

TABLE III
IMPORTANT WILDCATS AND DRY HOLES COMPLETED IN ARKANSAS AND NORTH LOUISIANA, 1944

Operator	Form	County or Parish	Check	Location	Sec. Twp. Rge.	Total Depth (Feet)	Deepest Formation Penetrated	Results	Date Completed
Union Prod. Co.	Crossett Lbr. D-2	Ashley	CNW NW	ARKANSAS	3-18S-9W	5,768	Smo. line	D & A	4-21-44
Union Prod. Co.	Crossett Lbr. E-1	Ashley	CNW SW		14-10S-9W	14,136	Urb. line	D & A	8-9-44
Union Prod. Co.	Crossett Lbr. F-1	Ashley	CNW SW		24-10S-9W	6,063	Smo. line	D & A	8-9-44
Skelly	Gaughan 1	Cahoon	CNW NW		3-14S-16W	3,683	Eagle Mills	D & A	8-9-44
John T. O'Neil	Cox-Wilson 1	Calhoun	CSE SE		15-14S-16W	4,343	Smo. line	D & A	9-16-44
Placid Oil Co.	Parish Coleman 1	Chicot	CNE NE		34-17S-2W	4,492	Smo. line	D & A	10-12-44
Placid Oil Co.	Roy Mathis 1	Chicot	CNE NE		22-18S-2W	4,800	Smo. line	D & A	2-22-44
Placid Oil Co.	Chicot	Chicot	CNE NE		21-18S-2W	4,657	No information	D & A	3-10-44
Clayton Greaves	Nichols 1	Clark	CNE NW		11-11N-3E	2,707	Smo. line	D & A	5-8-44
Young et al.	Nichols 1	Clark	CNE NW		35-11N-3E	962	No information	D & A	7-2-44
Crescent Drilling Co.	Cooley 1	Columbia	CNW SE		5-17S-20W	7,778	Smo. line	D & A	7-2-44
Frankel Bros.	Ullma Edwards 1	Columbia	CSE SW		16-17S-21W	8,168	Smo. line	D & A	3-9-44
McAlester Fuel Oil	J. J. Luck 1	Columbia	CNE NE		9-16S-21W	6,950	Smo. line	D & A	8-16-44
Midstates Oil Corp.	Beene-Dreyfus 1	Columbia	CNW NE		2-20S-20W	6,002	Hosston	D & A	6-10-44
Northern Ordnance	E. E. Wells 1	Columbia	CNW NW		25-16S-10W	7,269	Smo. line	D & A	6-29-44
Big Water Seaboard	Bedree 1	Columbia	CNW NW		10-18S-23W	8,202	Smo. line	D & A	3-1-44
G. H. Vaughn	Bedree 1	Columbia	CNW NW		18-18S-23W	7,592	Smo. line	D & A	3-1-44
G. H. Vaughn	F. H. Jackson 1	Columbia	CSE SW		8-16S-21W	7,592	Smo. line	D & A	12-5-44
Wright & Mix	Baker East 1	Columbia	CSE NE		13-17S-20W	7,004	Cotton Valley	D & A	2-22-44
Southern United Gas	G. C. Carter 1	Franklin	CNE NW		21-9N-22W	4,301	No information	D & A	4-10-44
Barnsdall Oil Co.	J. Brunson 1	Hempstead	CNW NW		36-14S-25W	6,545	Smo. line	D & A	2-18-44
Barnsdall Oil Co.	M. Cox 1	Hempstead	CSE SE		2-14S-20W	5,412	Smo. line	D & A	10-27-44
McWilliams Sanford 1	M. Cox 1	Hempstead	CSE SE		2-13S-27W	4,507	Eagle Mills	D & A	3-28-44
Red River Lbr. Co. 1	McWilliams Sanford 1	Hempstead	CNW NW		2-13S-27W	4,507	Smo. line	D & A	1-2-44
Kerlyn Oil Co.	Red River Lbr. Co. 1	Lafayette	CNW NW		10-10S-24W	6,603	Hosston	D & A	1-2-44
Tide Water Assoc. Oil	W. I. Payne 1	Lafayette	CSE NE		4-15S-25W	6,635	Smo. line	D & A	11-24-44
Curtis Kinard	W. I. Payne 1	Lafayette	CSE NE		18-10S-7W	4,266	Paleozoic	D & A	5-18-44
Leo Ochsenbein	Ada Mills 1	Lincoln	CNE SE		35-11S-30W	688	No information	D & A	4-26-44
H. H. Temple	Dierks Lbr. 1	Little River	CNE SW		30-11S-30W	858	No information	D & A	4-26-44
Ark. Oil & Gas Co.	E. T. Roberts 1	Miller	CNW SW		33-8S-28W	4,547	Hosston	D & A	1-13-44
Ark. Oil & Gas Co.	E. T. Roberts 1	Miller	CNW SW		33-8S-28W	4,547	Hosston	D & A	1-13-44
D. M. Fitzwater	E. L. Beck 1	Miller	CNW NW		36-15S-26W	3,553	Rodessa	D & A	1-2-44
DeKalb Agr. Assn. Inc.	Bass Bemis 1	Nevada	CNE NE		35-14S-21W	5,497	Smo. line	D & A	3-16-44
Barney Dunlap	Hart 1	Nevada	CSE SW		17-13S-21W	4,463	Smo. line	D & A	5-19-44
Magnolia Pet. Co.	Lester A-1	Nevada	CNE SW		36-14S-20W	5,475	Smo. line	D & A	1-29-44
Placid Oil Co.	J. B. Silvey 1	Nevada	CSE SE		14-14S-22W	5,059	Smo. line	D & A	7-18-44
Plymouth Oil Co.	M. J. Thompson 1	Nevada	CSE SE		3-14S-20W	5,500	Eagle Mills	D & A	3-19-44
W. H. Vaughn Jr. Corp.	M. J. Thompson 1	Nevada	CSE SE		3-14S-20W	5,500	Eagle Mills	D & A	3-19-44
Garland Anthony	J. K. Nixon 1	Nevada	CSE NE		6-15S-20W	4,215	Hosston	D & A	10-2-44
R. H. Crow	G. R. Shankle 1	Ouachita	CSE SE		33-12S-48W	3,256	Smo. line	D & A	2-7-44
S. A. Kinard	N. S. Yarbrough 1	Ouachita	CNW NW		30-15S-49W	6,387	Smo. line	D & A	10-26-44
Lachner & Hill	Cook 1	Ouachita	CNE NE		27-15S-48W	2,925	Sligo	D & A	8-11-44
Phillips et. Co.	J. W. Reynolds 1	Ouachita	CNE NE		21-14S-47W	3,701	Cotton Valley	D & A	8-11-44
Shelby Oil Co.	Betty Joyce 1	Ouachita	CSE SW		33-15S-18W	5,050	Smo. line	D & A	3-8-44
Shelby Oil Co.	Clayton & Clay 1	Ouachita	CSE SW		13-12S-18W	4,460	Smo. line	D & A	10-33-44
Shelby Oil Co.	L. T. Pate 1	Ouachita	CSE SW		9-14S-17W	4,351	Smo. line	D & A	10-33-44

P. B. Buckrange

P. B. 1632

TABLE III—Continued

Operator	Farm	County or Parish	Check	Location	Sec. Twp. Rse.	Total Depth (Feet)	Deepest Formation Penetrated	Results	Date Completed
LOUISIANA—Continued									
A. W. Phillips	Anthony A-1	DeSoto	C SE NE	9-11N-1W	5,007	Rodessa	75 MMCF/PD	D & A	8-26-44
Placid Oil Co.	Anthony A-1	DeSoto	C NE NW	22-21N-1W	7,530	Rodessa	D & A	D & A	2-19-44
Geo. Echols	Milliken 1	Franklin	C SE NE	22-21N-1E	5,103	Cotton Valley	D & A	D & A	3-24-44
C. L. Smith	Baker 1	Franklin	C NW NE	26-16N-0E	7,113	Rodessa	D & A	D & A	8-1-44
C. L. Smith et al.	Bates 1	Franklin	C SE SE	18-12N-8E	7,513	Paluxy	D & A	D & A	12-14-44
Calapor Mfg. Co.	J. B. Ely 1	Franklin	C SE SE	25-13N-7E	6,770	Comanche	D & A	D & A	11-6-44
Ark. Fuel Oil Co.	Edenborn 1	Grant	C NW SE	26-7N-3W	4,830	Marbrook	D & A	D & A	1-19-44
Placid Oil Co.	LaSalle 1	LaSalle	C NW NE	31-10N-2E	4,851	Midway	D & A	D & A	6-7-44
Placid Oil Co.	LaSalle 1	LaSalle	C NW NE	31-10N-2E	12,300	Lower Glen Rose	D & A	D & A	7-44
Placid Oil Co.	Tremont F-2	LaSalle	C SE NW	28-0N-2E	8,049	No information	D & A	D & A	11-20-44
California Co.	J. M. Norris 1	LaSalle	C NW NE	15-18N-1W	9,768	Cotton Valley	66-bbls. Dst.	D & A	10-38-44
Louisiana Gas	Liner 1	LaSalle	NE NE SE	31-10N-3W	6,210	Hosston	2 1/2 MMCF	D & A	3-15-44
C. H. Murphy	Sandheimer 1	Madison	SW NW NW	10-17N-1E	4,470	Paluxy	D & A	D & A	2-18-44
R. H. & J. Sanderton	3410th	Madison	SW NW NW	10-17N-1E	6,420	Paluxy	D & A	D & A	3-24-44
The Texas Co.	Kimball 1	Morehouse	SW SE	32-21N-6E	6,065	Smo. lime	D & A	D & A	10-10-44
The Texas Co.	Kimball 1	Morehouse	SW SE	32-21N-6E	5,934	Smo. lime	D & A	D & A	1-1-44
The Texas Co.	Lewisville Coop. 1	Morehouse	NE NW	6-22N-0E	5,450	Smo. lime	D & A	D & A	8-31-44
Breedlore	Lewisville Coop. 2	Morehouse	SE NE	36-23N-8E	4,917	Smo. lime	D & A	D & A	6-1-44
Kingwood Oil Co.	Adrian Ld. 1	Natchitoches	SW SW	2-11N-8W	3,405	Paluxy	D & A	D & A	12-13-44
La. L. & Exp. Co.	Pardee Co. 1	Ouachita	C NE SW	10-10N-2E	6,363	Hosston	D & A	D & A	12-18-44
C. H. Murphy	Wentley Tr. 2	Rapides	SE NE	25-35N-2W	7,200	Midway	D & A	D & A	10-10-44
C. H. Murphy	Wentley Tr. 2	Rapides	SE NE	25-35N-2W	4,111	Pyroclastic	D & A	D & A	12-18-44
C. H. Murphy	Sartor 1	Richland	NE SW	21-17N-0E	3,425	Paluxy	218 BPD	D & A	12-8-44
A. R. Chestnut	Thames 1	Sabine	SW SW	4-8N-13W	3,460	Paluxy	D & A	D & A	8-1-44
Hamill & Smith	Longbell Lbr. Co. 1	Sabine	SE SW	34-0N-13W	5,778	Hosston ?	D & A	D & A	3-3-44
Chas. J. Smith	Whitney Corp. 1	Sabine	NE NE	46-0N-13W	9,183	Comanche	232 BPD	D & A	6-8-44
The Callaway & Lbr. Co.	M. W. Brown 1	Texas	NE SE NW SW	46-0N-13W	9,130	Comanche	D & A	D & A	3-20-44
Chicago Mill & Lbr. Co.	Mutual A-1	Texas	SW NE	39-12N-10E	8,406	Comanche	D & A	D & A	3-20-44
Placid Oil Co.	Ayer Tr. 1	Texas	NW NE	18-14N-11E	9,770	Comanche	D & A	D & A	3-20-44
Sohio Prod. Co.	Lide W.	Texas	SW NE	22-12N-12E	9,855	Comanche	D & A	D & A	3-13-44
Union Prod. Co.	Fennord Jorden 1	Union	SW NE	18-11N-10E	10,022	Comanche	D & A	D & A	3-22-44
Sohio Prod. Co.	Moore 1	Union	NE NE	28-23N-2E	7,085	Smo. lime	D & A	D & A	11-21-44
H. S. Striel	Frost Lbr. Co. 1	Union	SE NE	23-23N-2W	3,595	Comanche	D & A	D & A	10-1-44
Wetzel Greenland	Frost Lbr. Co. 1	Union	SE NE	23-23N-2W	5,583	Cotton Valley	D & A	D & A	10-1-44
Wetzel	Davis 1	Webster	NE NE	33-18N-5W	7,060	Hosston	12.3 MMCF	D & A	6-26-44
Cotton Valley	Gray 1	Webster	Cont.	26-21N-10W	10,081	Cotton Valley	6 MMCF	D & A	12-18-44
Oper. Comm.	Dockia	Webster	NE NW	18-22N-0W	8,758	Cotton Valley	D & A	D & A	4-19-44
Phillips Pet. Co.	Jackson 1	Webster	SE NE	24-22N-10E	3,357	Igneous rock	D & A	D & A	7-9-44
California Co.	Webster	Webster	SE NE	27-13N-10E	5,501	Smo. lime	D & A	D & A	7-9-44
Pure Oil Co.	Winn	Winn	SE SW	5-12N-4W	6,114	No information	D & A	D & A	7-9-44
H. L. Hunt	Mansfield Lbr. Co. 1	Winn	SE SW	5-12N-4W	6,114	No information	D & A	D & A	7-9-44

Abbreviations: D & A, dry and abandoned; BPD, barrels per day; PB, plugged back; MCF, 1,000 cubic feet; MMCF, million cubic feet; Dst., distillate.

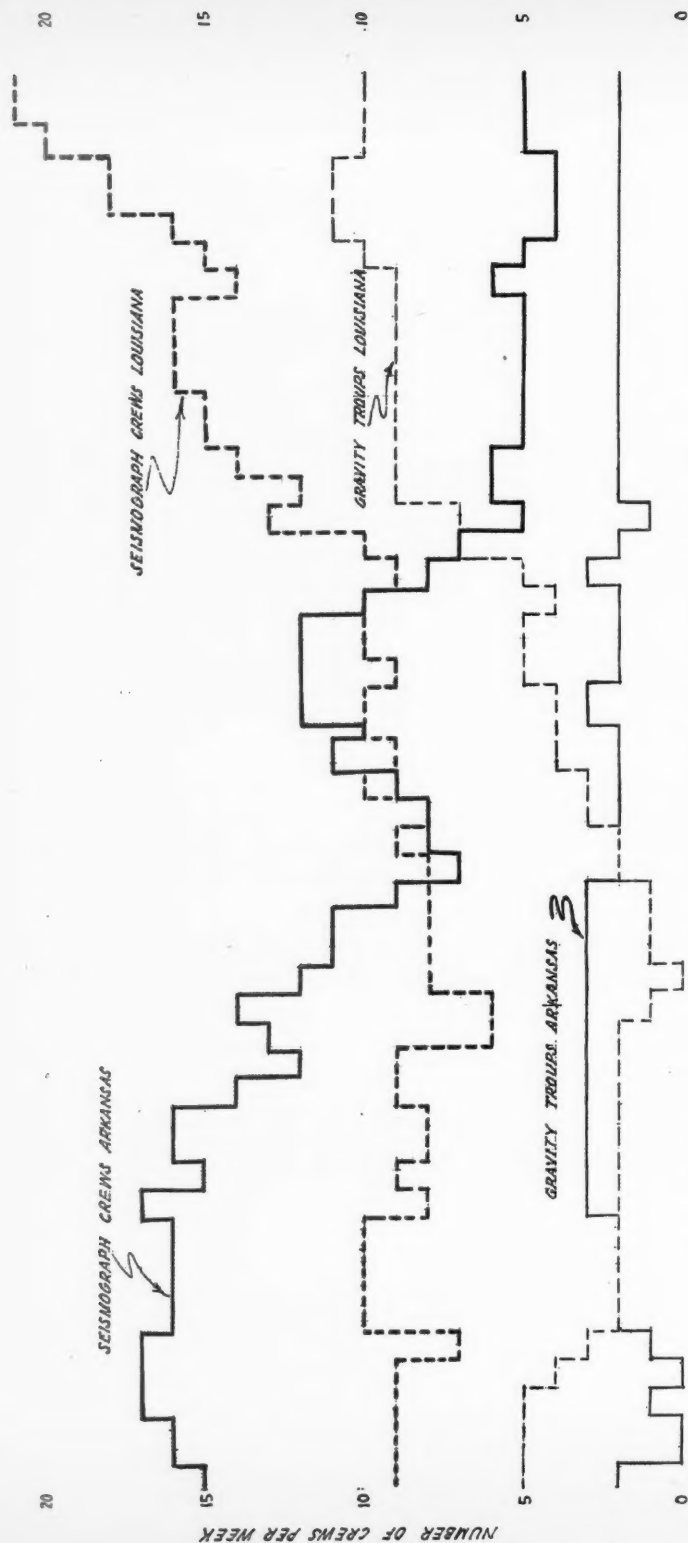


FIG. 2.—Graph showing geophysical activities per crew-week in North Louisiana and South Arkansas for year 1943.

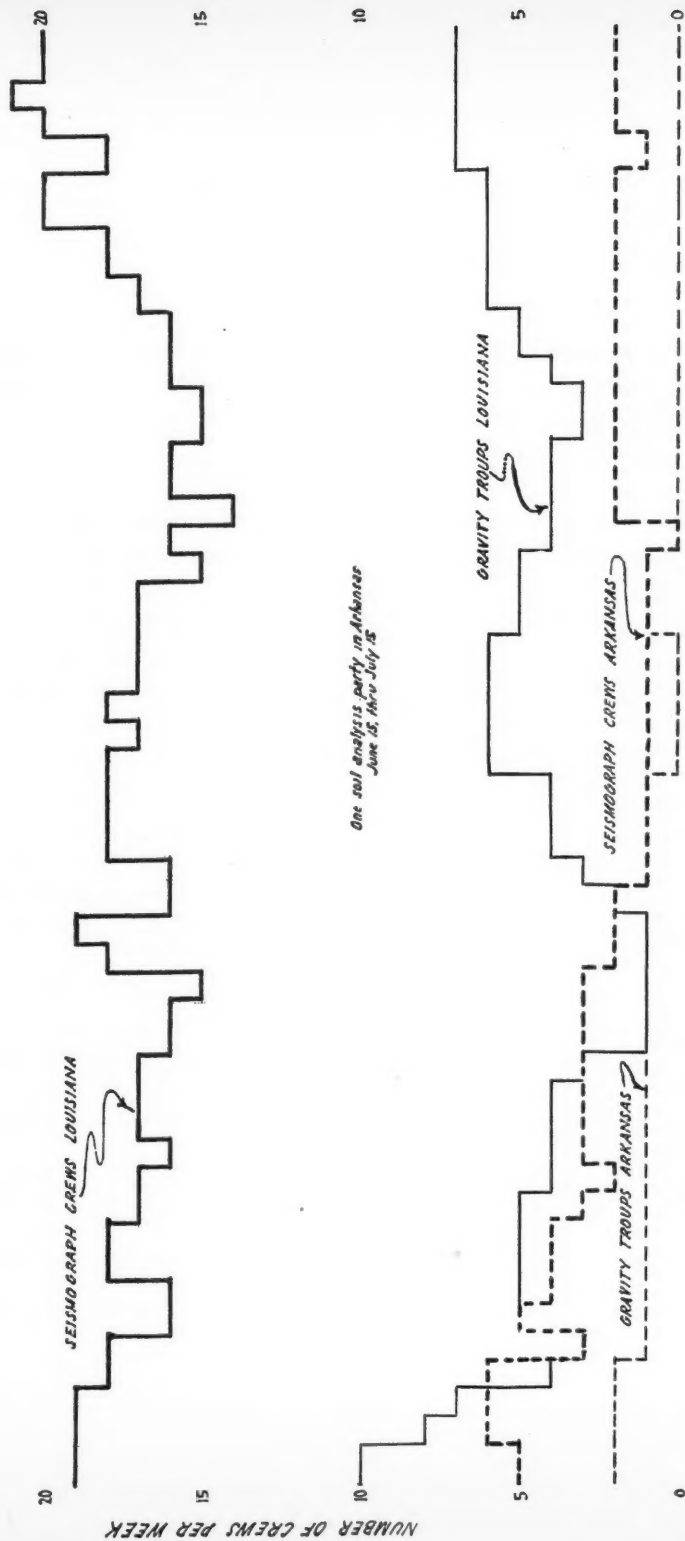


FIG. 3.—Graph showing geophysical activities per crew-week in North Louisiana and South Arkansas for year 1944.

A new salt dome was found in Caldwell Parish, Louisiana, by the Atlantic Refining Company's Louisiana Central Lumber Company No. 1. The salt was topped at 4965 feet, and a total of 1310 feet of salt was drilled before abandoning the hole at the depth of 6275 feet.

EXPLORATORY METHODS AND RESULTS

The reflection seismograph with the help of the gravity meter and subsurface geology led to the location of most of the wells discovering new fields. As can be seen from Figures 2 and 3, the reflection seismograph is still the most popular geophysical tool for exploration work in the area.

STRATIGRAPHY

To the writer's knowledge there have been no changes in nomenclature.

The age of a series of non-marine beds encountered in a deep well drilled in southeastern Ashley County, Arkansas, underlying the Eagle Mills salt and anhydrite remains unknown. The Union Producing Company's Crossett Lumber Company well No. E1 was dry and abandoned after drilling to the total depth of 11,136 feet. The well went out of Eagle Mills salt and anhydrite at the depth of 6485 feet. Between this depth and the total depth of the hole, a series of beds consisting mostly of non-marine dark red to maroon shales and sandy shales, and conglomerate zones, containing gravels upward to 2 inches in diameter were encountered. Several igneous intrusives traversed this red-bed section. No fossils were found.

The red-bed section lithologically is not similar to the Morehouse formation⁴ encountered in the Union Producing Company's Tensas Delta No. A1, located in Morehouse Parish, Louisiana, approximately 20 miles southwest of the Crossett No. E1. The age of these beds has not been determined, and the correlation is speculative.

TREND IN EXPLORATION, LEASING, AND DRILLING

As can be seen from Table II and Figures 2 and 3, the trend in 1944 was deeper drilling in both wildcat wells and old fields, and more geophysical work. There is no reason to expect a change in either exploration or drilling procedures during the coming year. To the writer's knowledge there have been no changes in the type of leases taken, or forms used.

⁴ Ralph W. Imlay and J. S. Williams, "Late Paleozoic Age of Morehouse Formation of Northeastern Louisiana," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 26 (1942), p. 1672.

DEVELOPMENTS IN SOUTHEASTERN STATES IN 1944¹

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ABSTRACT

Prompted by discoveries of oil fields in Florida and Mississippi late in 1943 and in Alabama and Mississippi in the early months of 1944, the southeastern states have enjoyed their most active period of geophysical and drilling exploration during 1944.

Alabama had its first commercial oil production as a result of discovery of the Gilbertown field by H. L. Hunt's A. R. Jackson No. 1, Sec. 2, T. 10 N., R. 4 W., Choctaw County, on February 16, 1944. Nine producers and 5 dry holes were drilled in the field during the year. Accumulative production for Gilbertown was 56,064 barrels through December, 1944.

In addition to the Gilbertown development, there were 21 wildcat wells drilled in Alabama: 4 in the Paleozoic province of northwest Alabama and 17 in the southern and southwestern part of the state. During 1943, 9 wildcats were drilled and abandoned.

Six wells were abandoned in Florida during 1944, one less than were drilled during the preceding year.

In the Sunniland field, Collier County, the Humble Oil and Refining Company's Gulf Coast Realty Company No. 1 pumped 11,832 barrels of 19° A.P.I. gravity oil in 1944. This is Florida's only producing well.

No production was established by 6 wells completed in Georgia in 1944.

The year's development in Mississippi was high-lighted by (1) discovery of 5 new fields in the southern part of the state; (2) proof of an appreciable oil-rim around the Cranfield structure in Adams County; (3) discovery of Eutaw production in the Eucutta field, Wayne County; and (4) minor extension of producing area in the Pickens field, Madison and Yazoo counties.

Four shallow piercement salt domes were discovered in 1944, and they, as well as several previously discovered domes, have been explored for sulphur. Only the Richton dome, Perry County, yielded non-commercial sulphur showings.

The Sun Oil Company's Hammett No. 1-A, Bruinsburg dome, Claiborne County, Mississippi, was completed, November 22, 1944, as a small gas well to mark first production on an interior piercement salt dome in Mississippi. Showings of gas in the Freeport Sulphur Company tests had encouraged later exploration.

Of the 1944 new discoveries, the Heidelberg field, Jasper County, has seen most rapid development due to diverse lease ownership and moderate producing depths. Production from the 57 wells completed in 1944 is from Eutaw and upper Tuscaloosa, on a graben fault system overlying a deep-seated salt dome.

The 4 other discoveries have had too little development for reasonable accuracy in predicting their significance. Three widely spaced wells have been completed in the Gwinville field, Jefferson Davis County. Only the discovery well is on production in the Mallalieu field, Lincoln County, in the Baxterville field, Lamar County, and in the Bruinsburg field, Claiborne County.

In 1944 there were 72 wildcats drilled (5 productive, 67 dry), 51 sulphur tests, and 129 field wells (113 productive, 16 dry). The figures for 1943 were: 59 wildcats (4 productive, 55 dry), 12 sulphur tests, and 36 field wells (28 productive, 8 dry).

The increasing success of wildcatting in Mississippi has resulted from more satisfactory interpretation of detailed geophysical surveys.

INTRODUCTION

The southeastern district includes the states of Alabama, Florida, Georgia, and Mississippi.

Regarded as one of the last frontiers in the search for domestic petroleum reserves, this area has seen the beginning of productive history that forecasts a tremendous future.

In this paper each state is discussed individually, with natural emphasis on development in Mississippi due to relative current activity.

¹ Manuscript received, April 10, 1945.

² Consulting geologist, Dixie Geological Service.



FIG. 1

For those not familiar with the nomenclature and general stratigraphy of Mississippi reference is recommended to the paper by Tom McGlothlin.³

ALABAMA

Southern and southwestern Alabama have seen an increased display of interest as a result of the proximity and geological relationship of that part of the state to southeastern Mississippi. This interest resulted in the discovery of Alabama's first and, to date, only commercial oil production.

Following geophysical work along a known east-west surface fault system in Choctaw County, Alabama, H. L. Hunt drilled and abandoned Robert T. Land No. 1, Sec. 36, T. 11 N., R. 5 W., late in 1943. The test had, however, cored a showing of oil in upper Eutaw sands, which encouraged further exploration.

The second test of the prospect was drilled approximately 5 miles east and 1 mile south of Land No. 1, and was completed as discovery well of the Gilbertown field.

The discovery well, H. L. Hunt's A. R. Jackson No. 1, Sec. 2, T. 10 N., R. 4 W., drilled to the total depth of 5380 feet in the Comanche, was plugged back to 2585 feet to be completed from a fracture zone in the Selma chalk. Showings of black oil had been noted on the pits while drilling through this zone, and it was only by that evidence that production could be expected; the electrical log offered no suggestion of presence of saturation.

The well was completed on February 16, 1944, flowing by heads at rate of 30 barrels of 19° A.P.I. gravity oil per day, while waiting on installation of pumping unit.

In developing the "chalk" production, difficulty has been encountered in selection of drill sites so located that the faults, with accompanying fracture zones, might be encountered in the chalk section. Side-wall cores following an electrical survey have nowhere indicated more than very thin veinlets of oil along fracture planes in gray to white, unsaturated chalk. The evident hazards entailed in search for production of this nature is further demonstrated by the fact that during 1944, 5 dry holes were abandoned while only 9 producers were successfully completed.

On August 24, 1944, H. L. Hunt's Robert Land No. 2, Sec. 36, T. 11 N., R. 5 W., was completed as first producer from upper Eutaw sands, pumping 50 barrels of 19° A.P.I. gravity oil and 40 barrels of salt water per day. The Land No. 2 is a north offset to the previously abandoned Land No. 1.

Subsequent development has established production between Land No. 2 and the original Gilbertown field, and though this production has not been proved to be continuous we feel that evidence favors usage of the Gilbertown field for the entire extent of the fault-line production.

Of the 14 wells drilled at Gilbertown, 5 have penetrated the basal Tuscaloosa "Massive" sand with no showings of oil noted below the Eutaw.

³ Tom McGlothlin, "General Geology of Mississippi," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 28, No. 1 (January, 1944).

At the end of 1944 there were three active operations at Gilbertown: one was rigging up, another was drilling, and the third was waiting on installation of pumping equipment.

A total of 56,064 barrels of oil was produced from the Gilbertown field during 1944. Most of the wells are also producing varying percentages of salt water for which a large central steam-treating system is being installed.

The lack of sufficient gas for lease operations encouraged installation of this type of treating system, which embodies a 250 KW generator to furnish power for electric motors installed as prime movers at the wells with individual pumping units.

In addition to Gilbertown development, there were 21 wildcats drilled and abandoned in 1944. The more significant of the Alabama wildcats are listed in Table I.

TABLE I

County	Location	Well	Total Depth (Feet)	Formation Penetrated
Escambia	10-3N-10E	Humble, Skinner 1	11,100	Comanche or older
Escambia	15-1N-10E	Hunt, Foshee-Miller 1	5,848	Comanche ?
Escambia	16-3N-12E	Hunt, Miller 2	6,186	Comanche
Marengo	3-16N-2E	Johnston, Peteet 1	4,523	Comanche or older
Washington	28-6N-4W	Humble, Scott 1	7,800	Comanche
Washington	33-6N-4W	Humble, Scott 2	7,327	Comanche
Washington	16-6N-4W	Humble, Williams 1	7,511	Comanche
Washington	20-6N-4W	Humble, Williams B-1	6,547	Comanche
Washington	27-4N-3W	Texas, Odom 1	8,240	Comanche
Washington	10-3N-3W	Texas, Stallworth 1	8,369	Comanche

Only 2 wildcat operations were active at close of the year, in Choctaw and Washington counties.

Geophysical and core-drill activity in Alabama increased from 213 crew-weeks work in 1943 to 834 crew-weeks in 1944. Most of this work was concentrated in southern and southwestern Alabama.

Table II gives the number of crew-weeks work done in Alabama by months and method.

TABLE II

	Core Drill	Gravity Meter	Magnetometer	Seismograph	Total
January	0	28	0	12	40
February	0	26	0	15	41
March	0	38	0	19	57
April	0	39	0	13	52
May	0	55	3	24	82
June	4	48	4	24	80
July	4	39	4	24	71
August	5	47	5	34	91
September	4	40	4	27	75
October	7	41	4	34	86
November	10	49	1	34	94
December	8	37	0	20	65
Total 1944	42	487	25	280	834
Total 1943	2	106	5	100	213

FLORIDA

No new production was established by six wells drilled and abandoned in Florida in 1944, however, these wells have served to supplement the scant sub-surface information.

In the Sunniland field, Collier County, the Humble Oil and Refining Company pumped a total of 11,832 barrels of 19° A.P.I. gravity oil from Gulf Coast Realty Company No. 1, Sec. 29, T. 48 S., R. 30 E., in 1944. Accumulated production for this, Florida's only producer, was 15,869 barrels through December, 1944.

The Humble Oil and Refining Company's Gulf Coast Realty Company No. 2, Sec. 30, T. 48 S., R. 30 E., was drilled to the total depth of 13,512 feet and abandoned. A showing of heavy oil was cored in slightly porous limestone at 11,636-11,639 feet, but was not of sufficient extent to justify a production test at that depth.

At present the Humble is drilling Gulf Coast Realty No. 4, Sec. 20, T. 48 S., R. 30 E., located $1\frac{1}{2}$ miles north of the discovery well.⁴

A list of tests completed in Florida during 1944 which contributed to the sub-surface knowledge of this state is given in Table III.

TABLE III

County	Location	Well	Total Depth (Feet)	Formation Penetrated
Collier	30-48S-30E	Humble, Gulf Coast 2	13,512	Comanche ?
Gulf	22-6S-9W	Pure, Hopkins 1	8,708	Comanche ?
Leon	15-2S-2E	Stanolind, St. Joe 1-A	6,520	Comanche ?
Madison	6-1S-10E	Hunt, Gibson 2	5,385	?
Madison	18-2S-11E	Hunt, Gibson 3	3,540	?

Only four wildcats were active in Florida at the end of 1944; however, it is expected that drilling activity will increase during 1945, and production possibilities will be enhanced by greater background of geophysical and core-drill work and interpretation experience.

Exploratory work had a greater percentage increase in Florida than in any other of the southeastern states. In 1943 there was a total of 217 crew-weeks of work reported, as compared with 1397 crew-weeks in 1944.

Table IV shows number of crew-weeks work during each month, divided by method used.

GEORGIA

Six wildcat wells were drilled in Georgia in 1944, with no showings of oil reported from any of them.

Further sporadic drilling along the Gulf Coastal Plain of Georgia will follow the geophysical exploration; however, no great increase in operations is foreseen until oil or gas production in some quantity is discovered in Georgia or adjacent areas of Alabama or Florida.

⁴ In May, 1945, the Gulf Coast Realty No. 4 cored and drill-stem tested a zone of saturated limestone which was intermittently porous from 11,559 feet to 11,597 feet. The result of this test promises a higher initial potential than in the discovery well.

TABLE IV

	Core Drill	Gravity Meter	Magnetometer	Seismograph	Total
January	8	22	5	8	43
February	8	35	4	8	55
March	9	61	5	9	84
April	20	58	4	6	88
May	25	78	6	11	120
June	31	71	8	10	120
July	32	93	8	15	148
August	39	119	16	19	193
September	26	82	20	8	136
October	28	76	19	10	133
November	39	81	20	11	151
December	34	67	17	8	126
Total 1944	299	843	132	123	1397
Total 1943	98	59	9	51	217

The wells drilled during the year in Georgia are listed in Table V.

TABLE V

County	Location	Well	Total Depth (Feet)	Formation Penetrated
Clinch	Lot 198, Dist. 12	Hunt, Musgrove 1	4,088	Quartzite
Clinch	Lot 523, Dist. 12	Hunt, Musgrove 2	3,460	?
Decatur	Lot 260, Dist. 21	Hunt, Metcalf 1	6,200	?
Echols	Lot 364, Dist. 13	Hunt, Superior 1	3,865	?
Mitchell	Lot 133, Dist. 10	Stanolind, Pullen 1	7,487	Basement
Wayne	Lot 7, Williams Sur.	California, Brunswick 1	4,626	Quartzite

The details have not been released on the Hunt wells, so that formations penetrated is not available at present time.

At the end of 1944, two wildcat wells were being drilled in Georgia in Atkinson and Toombs counties. Both of these wells have reported oil showings since the first of the year, but they were not of commercial significance.

During 1944 there were 209 crew-weeks of geophysical work reported, as compared with 94 crew-weeks in 1943. Table VI lists exploration work in crew-weeks by month and type of exploration.

TABLE VI

	Core Drill	Gravity Meter	Magnetometer	Seismograph	Total
January	0	0	4	8	12
February	0	0	4	8	12
March	0	0	9	10	19
April	0	0	8	5	13
May	0	3	10	5	18
June	0	4	8	4	16
July	0	4	7	3	14
August	0	8	10	0	18
September	0	7	14	0	21
October	0	10	16	0	26
November	0	12	12	0	24
December	0	12	4	0	16
Total 1944	0	60	106	43	209
Total 1943	0	47	27	20	94

MISSISSIPPI

Late 1943 discovery of the Cranfield and Eucutta fields in the eastern and western extremities of south-central Mississippi began a period of extensive drilling and exploration activity which continued throughout 1944, and contributed to discovery of 5 new fields and 4 salt domes in the southern part of the state.

NEW FIELDS

1. *Heidelberg*.—The Heidelberg field, Jasper County, was discovered by completion of the Gulf Refining Company's Helen Morrison No. 1, Sec. 30, T. 1 N., R. 13 E., on January 30, 1944.

Interest in the Heidelberg area dates from the early 1930's, at which time surface work for the Eastman-Gardiner Lumber Company, under supervision of Urban B. Hughes, led to location of structural closure and suggestion of surface faulting. A block of leases was assembled at that time, but due to disappointment resulting from a dry hole on a similar prospect in Wayne County, the block was not drilled.

The Gulf Refining Company became interested in the area as a result of gravity-meter work, which indicated a pronounced gravity minimum over the prospect, suggestive of deep-seated salt movement. After detailed seismic work the present block was assembled and the location for the Gulf Refining Company's Helen Morrison No. 1 was staked in the SW. $\frac{1}{4}$, SE. $\frac{1}{4}$ of Sec. 30, T. 1 N., R. 13 E.

Drilled to the total depth of 6578 feet, this well penetrated the geologic sequence from the Forest Hill formation, Vicksburg group, of lower Oligocene age, to 174 feet into the Comanche section. No showings of oil were noted below upper 30 feet of the Tuscaloosa.

Subsequent control has proved faults in the Helen Morrison No. 1 as follows: 80-foot fault at approximately 850 feet in middle Claiborne; 170-foot fault at 3160 feet in basal Wilcox; 265-foot fault at 3950 feet in Selma chalk; and 255-foot fault at 4945 feet in the Eutaw.

The Eutaw formation extends from 4740 (−4412) to 4988 (−4660) feet in Morrison No. 1 and has a showing of heavy dark brown to black oil in approximately 67 feet of porous sands. The Eutaw is approximately 255 feet shorter than normal due to faulting. The heavy oil saturation continues in Tuscaloosa porosity to approximately 5037 (−4709) feet; however, the producing section includes only better porosity of the basal Eutaw formation.

The Morrison No. 1 was completed, January 30, 1944, flowing 429 barrels of 19° A.P.I. gravity oil per day through $\frac{3}{8}$ -inch tubing choke, through perforations at 4958–4968 feet.

The second completion in the Heidelberg field was the first well to produce from sands within the upper Tuscaloosa formation. This well, the Gulf Refining Company's Lewis-Morrison Unit No. 1, NE. $\frac{1}{4}$, SE. $\frac{1}{4}$ of Sec. 30, T. 1 N., R. 13 E., is diagonal northeast offset to the discovery well. The top of the Eutaw was en-

countered at 4414 (-4069) feet, and all porosity to 5030 feet was saturated with oil. The top of the Tuscaloosa is at 4859 (-4514) feet, and the total depth is 5050 feet.

The Lewis-Morrison No. 1 was completed, April 8, 1944, flowing 1001 barrels of pipe-line oil per day through 22/64-inch tubing choke through perforations at 4518-4948 feet. The gravity of the oil was 24.5° A.P.I.

The third well to be drilled at Heidelberg, the Sun Oil Company's Mack Lindsey No. 1, NW. $\frac{1}{4}$, NE. $\frac{1}{4}$ of Sec. 31, T. 1 N., R. 13 E., was junked at the total depth of 4125 feet after having a gas blow-out from porosity in upper Selma chalk. Although no attempt has been made to produce gas from this zone, the electrical logs indicate a moderate accumulation, with possibility of some oil on flank wells.

The fourth completion for Heidelberg was the Gulf Refining Company's Gus Husband No. 1, Sec. 25, T. 1 N., R. 12 E., one mile northwest of Helen Morrison No. 1. This well was abandoned as dry on April 30, 1944, at the total depth of 5716 feet, in upper Tuscaloosa. No showings were encountered and lack of important faulting suggested a downthrow well, west of the known zone of major faulting.

On June 18, 1944, the Gulf Refining Company completed as a producer John Morgan No. 1, SW. $\frac{1}{4}$, SW. $\frac{1}{4}$ of Sec. 35, T. 1 N., R. 12 E., 2 miles southwest of Gus Husband No. 1. Completion of this well served to prove the existence of a graben fault system overlying the Heidelberg structure, although the detailed mapping of individual faults is still in question in the western area.

At the end of the year a total of 57 producing wells had been completed in the Heidelberg field, of which 13 are in the west part of the field.

The 44 wells in East Heidelberg have proved productive closure of 682 feet; top of Eutaw on the highest well to date being -4004 feet and generally accepted water level at -4686 feet. The western limits of production in East Heidelberg are bounded by two roughly parallel major faults approximately $\frac{1}{2}$ mile apart. The zone between these faults, though productive, is highly and irregularly fractured. Control offered by one well to 40 acres prevents detailed mapping of many of these intermediate faults.

Displacement of the faults encountered in East Heidelberg increases rapidly with depth due to the combined effect of recurrent movement and variation in competence of the sediments. Maximum displacement of more than 800 feet was noted in the Gulf Refining Company—Claud B. Hamill's Rowell Unit No. 1, NW. $\frac{1}{4}$, NE. $\frac{1}{4}$ of Sec. 30, T. 1 N., R. 13 E. This fault was cut at approximately 5700 feet, in basal Eutaw.

In West Heidelberg approximately 375 feet of productive closure has been proved from -4428 feet to water level of -4800 feet. Faulting in the western system has not demonstrated the magnitude of those in East Heidelberg but due to the multitude of lesser faults, accurate interpretation is, as yet, impossible.

At the end of the year an unproductive band approximately 2 miles wide separated the East and West Heidelberg producing areas.

Development of the Heidelberg field is continuing, and at the beginning of 1945 there were 6 active operations in East Heidelberg and 5 in West Heidelberg.

Popular usage has established the following producing zone names, applicable to both East and West Heidelberg: Morrison sand zone, including approximately the upper 100 feet of the Eutaw; City Bank sand zone, including the next 60 feet of the Eutaw; Stanley sand zone, including, the next 140-150 feet of the Eutaw; and Christmas sand zone, being the basal 150-170 feet of the Eutaw. The few lenticular Tuscaloosa sands which have been proved productive remain unnamed.

A great variation has prevailed in method of completion of wells in Heidelberg, although consistent usage has been made of casing perforation. Some operators have perforated all sands which appear to have sufficient porosity to be considered productive, while others have resorted to selective perforation in zones of slightly higher-gravity oil or higher permeability.

2. *Gwinville*.—The Gwinville field, Jefferson Davis County, was discovered by Sid W. Richardson's C. E. Berry No. 1, SE. $\frac{1}{4}$, NW. $\frac{1}{4}$ of Sec. 24, T. 9 N., R. 19 W. The completion date on the discovery well was August 11, 1944.

This area had been highly regarded for several years due to the presence of a large and pronounced gravity minimum over the prospect; however, experience tables in evaluation of gravity-meter work had not been sufficiently established to justify assembling a block over the entire area by a single company. As a result, the leases are now held by several major companies and independent operators.

In 1940, W. J. Richardson drilled Maggie Berry No. 1 in Sec. 15, T. 9 N., R. 19 W., but the well was abandoned at the total depth of 8523 feet. No showings were noted in basal Eutaw or upper Tuscaloosa. The top of the Eutaw shale was encountered at 7964 (-7536) feet, with the first porosity developed at 8321 (-7893) feet, in lower Eutaw.

Encouraged by "dry-hole letters" from major companies interested in the area, S. W. Richardson drilled C. E. Berry No. 1 to the total depth of 9967 feet in Comanche strata. Gas-condensate sands, cored or indicated by electrical log from 7730 to 8138 feet, totalled 155 feet of effective porosity in basal Eutaw and upper Tuscaloosa. The first salt water was noted at 8170 (-7716) feet, and no further showings of oil or gas were found below that point.

A fault of approximately 400 feet displacement was cut in C. E. Berry No. 1 at 6990 feet; however, the two additional wells completed by the end of the year had not given definite control on the strike of this fault or whether it is a component of a graben system.

The discovery well is dually completed from basal Eutaw and upper Tuscaloosa sands, perforated at 7855-7880, 8075-8106, and 8120-8132. This upper zone in basal Eutaw, is producing through 7-inch casing, while the two lower sands in Tuscaloosa are producing through 2-inch tubing.

On initial tests the C. E. Berry No. 1 produced 7,300,000 cubic feet of gas with 73.1 barrels of 54° A.P.I. gravity condensate, through $\frac{1}{4}$ -inch choke on casing

and tubing. The well does not have pipe-line outlet for gas, and has only produced to furnish fuel for drilling the Superior Oil Company's Willie Durr No. 1.

The Durr No. 1, Sec. 19, T. 9 N., R. 18 W., is located approximately one mile southeast of C. E. Berry No. 1 and was 125 feet lower than the discovery well on top of the Eutaw shale section. The gas zone at Durr No. 1 extended from 7871 to 8146 feet, with the first definite water sand topped at 8162 (-7698) feet.

The Superior Oil Company completed Durr No. 1 on December 12, 1944, producing gas and water-white condensate through perforations at 7943-8025 feet.

Completion of the Gulf Refining Company's D. L. Mullins No. 1, Sec. 34, T. 9 N., R. 19 W., extended production $2\frac{1}{2}$ miles southwest of Richardson's Berry No. 1. More significant than the areal extension was the addition of productive interval in the upper Tuscaloosa and discovery of an oil column in an upper sand of the basal Tuscaloosa "Massive sand" zone.

On the top of the Eutaw shale the Mullins No. 1 was 230 feet lower than C. E. Berry No. 1 and cores encountered salt-water sand in upper Tuscaloosa at a point roughly equivalent to the water contact on the two previously completed wells. No further cores were taken in upper Tuscaloosa; however, the electrical log exhibited "kicks" prompting side-wall cores which had gas odor and light stain in middle Tuscaloosa. These sands were not tested and there is no confirming evidence that either of the previously completed wells had showings of any kind below the first salt-water sand.

The producing sand, from 9220 to 9253 feet, was perforated in a 10-foot section at 9224 to 9234 feet and completed, December 17, 1944, flowing at the rate of 192 barrels per day through $\frac{1}{4}$ -inch tubing choke. Original gravity was 39.5° A.P.I. and the gas-oil ratio was 3000 to 1; however, the ratio increased to approximately 10,000 to 1 while producing an average of 150 barrels of oil per day.

At the end of the year only two locations were pending at Gwinville, both of which were waiting on rig. One location, the Gulf Refining Company's V. G. Gholar No. 1, is a north offset to D. L. Mullins No. 1; the other, the Superior's Alex Thompson No. 1, is $1\frac{3}{4}$ miles east of Durr No. 1. Both have subsequently been proved productive.

3. *Mallalieu*.—The Mallalieu field, Lincoln County, was discovered by The California Company's W. C. Douglas No. 1, NE. $\frac{1}{4}$, SE. $\frac{1}{4}$ of Sec. 10, T. 6 N., R. 8 E.

The first known interest in this area dates from seismic work by The California Company in 1937. Gravity-meter work over the prospect does not provide more than the barest suggestion of an irregularity.

Drilling operations on W. C. Douglas No. 1 were begun, May 29, 1944, and the well was completed, August 24, 1944.

After coring to the total depth of 10,601 feet an electrical log was run which showed basal Tuscaloosa "Massive sand" porosity from 10,524 to 10,560 feet. Cores in this zone yielded saturated sand.

After the electrical survey was made, the hole was deepened to 10,642 feet with no further showings encountered, and casing was cemented on bottom.

For production tests, the casing was perforated at 10,520-10,560 with 238 shots and the well flowed 374 barrels of 38.1° A.P.I. gravity oil per day through 5/32-inch tubing choke. Tubing pressure was 1075 pounds and the gas-oil ratio was 440 to 1.

Since completion, the flowing pressure has decreased considerably and varying amounts of salt water are produced daily. There is some question about the source of the salt water. High connate-water content of the saturated section and a poor cement job are considered as possibilities. No remedial work has been attempted.

At the end of the year only the west offset to the discovery well, J. S. Nordan No. 1, had reached the producing formation, and though it was structurally 9 feet higher than W. C. Douglas No. 1, the "Massive sand" porosity was not sufficiently developed to justify testing. The well was later junked and abandoned at 11,700 feet in the Comanche, with no showings reported.

The two other operations, north and east of the discovery, had not been drilled to sufficient depth to determine their relative structural position.

If the erratic sand condition evidenced by J. S. Nordan No. 1 is not characteristic of the top of the structure, the Mallalieu field should have rapid development due to the short-term leases held by The California Company and other operators in the area.

4. *Baxterville*.—The Baxterville field, Lamar County, was discovered by the Gulf Refining Company's C. V. Cooper No. 1, NE. $\frac{1}{4}$, NW. $\frac{1}{4}$ of Sec. 7, T. 1 N., R. 16 W., completed on November 18, 1944, producing from perforations in the basal Tuscaloosa "Massive sand."

The Baxterville prospect was originally worked as a gravity anomaly by the Gulf Refining Company. Subsequent seismic work completed the exploration program and C. V. Cooper No. 1 was spudded on August 8, 1944.

No showings were noted in the section penetrated from the Catahoula through the Cretaceous chalk; however, the first sand development below the chalk, in basal Eutaw, has gas-condensate saturation.

The first porous gas sand is shown at 7543 feet by electrical log, with the top of the Tuscaloosa placed at 7605 feet. The first light oil stain was noted in cores at 7766-7776 feet and continued to 7806-7816 feet. Though the drill-stem test at 7786-7816 feet was predominantly a gas test, there was recovered 180 feet of 44.3° A.P.I. gravity oil.

Thin sand streaks were cored from 7850 to 7874 feet. They had gas at the top with no stain and had heavy black oil saturation at the bottom. The heavy oil saturation continues below that point but core recoveries were not sufficiently complete to determine a definite water level in the upper Tuscaloosa.

The Marine Tuscaloosa black-shale section was logged from 8059 to 8428 feet, with the first porous sands in the lower Tuscaloosa occurring at 8544-8549,

8566-8575, and 8590-8597 feet. The sands are assumed to contain gas, from the character of the electrical log.

The first broken sands of the "Massive sand" zone were encountered at 8690-8714 feet, and were saturated with heavy black oil. The main body of the "Massive sand" was topped at 8725 feet and had black oil saturation in a practically unbroken porous interval to 8832 feet. From 8832 to 8880 feet the saturation continued, though core analysis and drill-stem test indicated salt water.

The writers recognize the top of the Comanche at 8910 feet; however, by electrical log there is possibility that the point is at 8994 feet.

A slight showing of heavy oil occurred in a Comanche sand 9020-9030 feet, with salt water in the remainder of that sand zone which continues, with a few shale breaks, to the total depth of 9080 feet.

For completion tests, the C. V. Cooper No. 1 was perforated from 8690 to 8714 feet and from 8734 to 8744 feet, in upper part of the massive sand, and on initial production tests the well flowed at the rate of 757 barrels of 16.5° A.P.I. gravity oil per day through $\frac{1}{2}$ -inch tubing choke. The gas-oil ratio on completion was 200 to 1. Considerable difficulty is expected in the disposition of this oil due to its extreme viscosity.

Preliminary crude analysis of the oil is as follows: gravity 15.1°; flash point 90.524; gasoline 4 per cent; kerosene 6 per cent; gas oil 24 per cent; lube base, waxy 10 per cent; and asphalt 55 per cent.

Three locations had been staked for additional tests at Baxterville; however, none of them had begun operations by end of 1944.

5. *Bruinsburg*.—The Bruinsburg field, Claiborne County, was discovered by completion of a gas well, the Sun Oil Company's W. R. Hammett No. 1-A, Sec. 2, T. 11 N., R. 1 W., on November 22, 1944.

The Freeport Sulphur Company had encountered a showing of gas in a sulphur exploration test on the dome; following this, the Sun staked location for W. R. Hammett No. 1 in Sec. 2, T. 11 N., R. 1 W. This well had a gas blow-out while a core was being brought out of the hole from the total depth of 1837 feet. The operators were unable to recondition the hole to set casing and the well was plugged and abandoned, July 24, 1944.

Following the loss of the first hole, location was staked for a twin well, Hammett No. 1-A, also in Sec. 2, T. 11 N., R. 1 W. The Hammett No. 1-A had a gas sand at the top of the Cockfield formation from 930 to 964 feet. The well was cored from the lower Claiborne into salt at 2315 feet and was stopped at the total depth of 2324 feet in salt.

Casing was perforated at 935-945 feet and the well was completed, flowing an estimated 5 million cubic feet of dry gas per day through $\frac{1}{2}$ -inch tubing choke.

The W. R. Hammett No. 1-A has produced gas for drilling purposes on the Sun Oil Company's W. R. Hammett No. 2, Sec. 2, T. 11 N., R. 1 W., approximately 650 feet southwest of Hammett No. 1-A. The Hammett No. 2 had not encountered any showings at the end of the year.

This gas discovery is not expected to represent a significant reserve; however, it is the first commercial production on an interior piercement dome in Mississippi.

DEVELOPMENTS IN FIELDS DISCOVERED PRIOR TO 1944

In addition to the five new field discoveries which have been discussed there were extensions of production at Cranfield and Eucutta which were of equal significance to Mississippi development.

1. *Cranfield*.—The Cranfield field, Adams County, provided one of the highlights of the year by discovery of a band of oil production in the basal Tuscaloosa "Massive sand."

The discovery well for Cranfield, The California Company's National Gasoline Company No. 1, Sec. 52, T. 7 N., R. 1 W., was completed in October, 1943, as an oil producer from a Wilcox sand after testing gas-condensate from the basal Tuscaloosa "Massive sand."

On January 23, 1944, The California Company's National Gasoline Company No. 2, Sec. 53, T. 7 N., R. 1 W., was completed as an oil well from the "Massive sand." This well is located a little more than one mile southwest of the discovery.

The top of the "Massive sand" porosity in the National Gasoline Company No. 2 was recognized at 10,344 (−9,990) feet, or 154 feet lower than in the discovery well.

Information from National Gasoline Company No. 2 and the 10 additional "Massive sand" completions in 1944 has established a known productive closure of 229 feet, of which 95 feet is in the oil column. The oil rim on the west flank of the structure averages approximately $\frac{1}{2}$ mile in width.

Three wells were drilled as attempted Wilcox producers; however, only one was successfully completed. The California Company's Laurie G. Ratcliffe No. 1, Sec. 52, T. 7 N., R. 1 W., was completed, March 15, 1944, flowing 124 barrels of 40.5° A.P.I. gravity oil through $\frac{1}{2}$ -inch tubing choke. Perforations in Ratcliffe No. 1 were at 5,875–5,880 feet in the same sand which is productive on the discovery well, National Gasoline Company No. 1.

On January 1, 1945, there were 5 active wells in the Cranfield field, all of which were to test the "Massive sand."

Only the west and southwest flanks of the structure have been developed to date, so that the rate of dip on the east and north flanks remains to be determined.

2. *Eucutta*.—The Eucutta field, Wayne County, was discovered by the Gulf Refining Company's Aden Davis No. 1, Sec. 2, T. 9 N., R. 9 W., on October 7, 1943. Production was obtained from the top of the basal Tuscaloosa "Massive sand" zone; however, the well was not considered commercial and after several salt water tests on Eutaw sands the well was temporarily abandoned, April 14, 1944.

On March 8, 1944, the Humble Oil and Refining Company's G.M.&O. R.R. Company No. 1, Sec. 1, T. 9 N., R. 9 W., was completed as the first Eutaw producer in the Eucutta field. The well pumped at the rate of 187 barrels of 27° A.P.I. gravity oil in 24 hours from perforations at 5,058-5,070 feet.

Subsequent drilling has revealed a faulted structure with production coming from upper Eutaw sands in 32 wells.

One well, which crossed a fault below the Eutaw had an oil showing in the upper Tuscaloosa and pumped a small amount of oil and salt water for a time from a Tuscaloosa sand.

Sand development at Eucutta is similar to that at Heidelberg, except that the Morrison sand zone does not have consistent porosity. The City Bank and Stanley sand zones occur approximately 85 and 155 feet below the top of the Eutaw. A "blanket" water level of -4,880 feet has been used for all Eutaw sand at Eucutta, and appears to be valid.

Nine wells had an active status on December 31, 1944, in the Eucutta field.

3. *Pickens*.—The Pickens field, Madison and Yazoo counties, had 8 additional producers added during 1944, bringing the field total to 41. One well, drilling at end of the year, was later abandoned.

SALT-DOME DEVELOPMENT

Of less direct economic significance, but of considerable importance to regional geology and search for petroleum, are the piercement salt domes of the interior basin.

A brief discussion of the four newly discovered domes and exploratory work on those previously located follows.

1. *Bruinsburg*.—The Bruinsburg dome, Claiborne County, was discovered by the Freeport Sulphur Company's W. R. Hammett No. 2, Sec. 1, T. 11 N., R. 1 W. Drilled to the total depth of 2,091 feet in salt, the test was abandoned on March 10, 1944. The top of the salt, at 2,065 feet, was encountered near the base of the Claiborne.

Showings of gas were noted in this well but since the Freeport Sulphur Company had obtained only the sulphur exploration rights, the gas sands were not tested. Subsequent Sun Oil Company operations on the Bruinsburg dome have been mentioned previously.

In addition to the discovery well, the Freeport Sulphur Company drilled 4 other tests on the Bruinsburg dome, but no sulphur showings were reported.

2. *Allen*.—The Allen dome, Copiah County, was discovered by the Sun Oil Company's Case Lumber Company No. 2, Sec. 5, T. 9 N., R. 6 E., which went from upper Wilcox into cap rock at 2,445 feet and salt at 2,774 feet. The well was completed, March 15, 1944, at the total depth of 2,800 feet, in salt.

On May 25, 1944, the Sun Oil Company's Russ Ferguson No. 1, Sec. 6, T. 9

N., R. 6 E., was completed as a flank test on the Allen dome. The Ferguson No. 1 was abandoned at the total depth of 6,005 feet after penetrating the Wilcox group to the top of the Midway with no showings of oil or gas.

The Allen dome has not been drilled for sulphur.

3. *Richton*.—The Richton dome, Perry County, was discovered by the Exploro Corporation's W. E. Carter No. 1, Sec. 35, T. 5 N., R. 10 W. The discovery well did not penetrate the cap rock material into salt but was completed, October 15, 1944, at the total depth of 700 feet in anhydrite.

The Richton dome is the shallowest dome yet to be drilled in Mississippi, salt having been encountered at 722 feet in the Exploro Corporation's Masonite Corporation No. 7, Sec. 22, T. 5 N., R. 10 W. Long prior to conclusive gravimeter and seismic work by the Gulf Refining Company, surface expression of the dome had been recognized.

During the drilling of the 22 sulphur tests completed in 1944, on the Richton dome, Mississippi had its first royalty "play" based on sulphur possibilities. Interest was aroused by the fact that a greater number of tests were being drilled than has been the case of previously drilled salt domes. This, plus enlargement on fact, occasioned royalty prices of \$250 per acre.

It has been reliably revealed that only very slight traces of sulphur were found in any of the tests.

Since first of the year 11 additional tests were drilled and work completed at Richton.

The Exploro Corporation, exploration agency of the Texas Gulf Sulphur Company, changed operating names on December 1, 1944, to Minsearch Corporation.

4. *Richmond*.—The Richmond dome, Covington County, was discovered by the Freeport Sulphur Company's Mrs. M. Beasley No. 1, Sec. 17, T. 6 N., R. 15 W. The discovery well was abandoned in anhydrite at the total depth of 1,740 feet, on November 24, 1944.

The top of the salt was recognized at 1,954 feet in the Freeport Sulphur Company's Mrs. P. Searborough No. 1, Sec. 17, T. 6 N., R. 15 W., that being the only test of the three drilled which encountered salt. No showings of sulphur, oil, or gas have been reported from these three tests.

In addition to the drilling on the four salt domes discovered in 1944, older domes were explored as follows.

Byrd.—The Byrd dome, Greene County, had four unsuccessful sulphur tests by Exploro Corporation in September and October.

This prospect, originally found by the Gulf Refining Company exploration work, has been farmed out to the Humble Oil and Refining Company, which drilled a 5,573-foot exploration hole on the top of the dome, in Sec. 16, T. 3 N., R. 7 W. This hole was used for detailed seismic work preliminary to staking location for a deep flank test.

Leedo.—The Leedo dome, Jefferson County, had three sulphur tests by the Exploro Corporation in April, 1944.

On the south flank of the dome, the Gulf Refining Company's Ella M. Cato No. 1, Sec. 30, T. 8 N., R. 4 E., was abandoned at the total depth of 10,920 feet in the basal Tuscaloosa. This test penetrated the first thrust block which has been noted on any Mississippi salt structure. After drilling 909 feet below the top of the Cretaceous, the well crossed a fault which caused repetition of more than 1,750 feet of section, going back into Midway, 858 feet above the top of the Cretaceous. Below that point a section which was elongate due to steep dip was penetrated to test the basal Tuscaloosa "Massive sand." No showings were encountered.

Tatum.—The Tatum dome, Lamar County, had a deep test on the west flank of the dome. This well, the Shell Oil Company's Hibernia Bank and Trust No. 1, Sec. 14, T. 2 N., R. 16 W., was cored and drilled to the total depth of 9,565 feet, in Comanche strata, with no significant showings.

Arm.—The Arm dome, Lawrence County, though it had not been confirmed by cap rock or salt tests, was interpreted as being a piercement dome by the Gulf Refining Company gravity-meter and seismic exploration.

The Gulf Refining Company's S. N. Hickman No. 1, Sec. 8, T. 6 N., R. 20 W., was drilled to 9,276 feet in the Comanche, and, although the test was junked at that depth, no showings had encouraged prospects for any formations below the abandonment depth.

The Arm prospect is another of these piercement domes which have been farmed out to the Humble Oil and Refining Company, and at end of the year an exploration hole was being drilled on top of the dome.

Ruth.—The Ruth dome, Lincoln County, had the only piercement dome flank test to find sufficient encouragement to set casing for production tests.

The California Company's Lincoln County Board of Supervisors No. 1, Sec. 16, T. 5 N., R. 9 E., was drilled to the total depth of 8,701 feet, after encountering cap rock material at 8,638 feet.

Six hundred twenty-five feet of 7-inch casing was run to bottom and cemented in place with 150 sacks in order to make selective drill-stem tests on sands which appeared favorable on the electrical log. Five drill-stem tests were taken on four perforated intervals from 8,461 to 8,536 feet in what is probably the first Comanche sand. Salt water, reportedly cut with slight amount of gas and oil, was recovered on these tests.

Later the well was whipstocked at 1,708 feet and new hole was drilled to 4,002 feet in the Wilcox to recheck a possible Wilcox oil showing. No further tests were made and the well was abandoned, March 3, 1944.

Lampton.—The Lampton dome, Marion County, was explored for sulphur by the Exploro Corporation, which drilled 9 tests on the dome. No significant sulphur showings were noted.

On April 23, 1944, the Gulf Refining Company abandoned E. H. Bradshaw

No. 2, Sec. 27, T. 3 N., R. 17 W., on the southeast flank of the dome. At the total depth of 9,241 feet, the test was junked after unsuccessful attempts to recover stuck drill stem.

The top of the Cretaceous chalk was encountered at 6,097 feet with the base of chalk faulted at 6,557 feet. Below that point no definite correlations are possible due to extreme dips encountered; however, at the total depth the well appears to be in marine Tuscaloosa.

At the end of the year a second deep flank test was in progress. The Gulf Refining Company's E. H. Bradshaw No. 3, Sec. 29, T. 3 N., R. 17 W., was being drilled 2 miles southwest of E. H. Bradshaw No. 2.

D'Lo.—The D'Lo dome, Simpson County, had 4 sulphur tests drilled by the Exploro Corporation, in Secs. 8, 16, and 17, T. 2 N., R. 4 E. No showings of any kind were found in these wells.

New Home.—The New Home dome, Smith County, was also explored by the Exploro Corporation without success; however, a showing of heavy black oil was cored in Stringer No. 1, Sec. 5, T. 10 N., R. 13 W.

After recovering cap-rock limestone saturated with heavy asphaltic oil in cores at 1,525–1,585 feet, the Gulf Refining Company assumed control of the well and set casing at 1,523 feet. A drill-stem test at 1,523–1,585 feet recovered black sulphur water with a slight showing of heavy oil. The Exploro Corporation then resumed drilling to the total depth of 1,730 feet in anhydrite.

TABLE VII

County	Location	Well	Total Depth (Feet)	Formation Penetrated	Remarks
Adams	17-6N-2W	Evans, Parker 1	11,015	Comanche	Massive sand shaled out.
Adams	9-8N-2W	Humble, Stowers 1-A	12,012	Comanche	Slight oil shows in Wilcox. Massive sand shaled out.
Attala	28-14N-5E	Halliburton, Hester 1	5,435	Paleozoic (?)	
Claiborne	4-10N-3E	Sohio, Mackey 1	10,127	Comanche	
Copiah	2-10N-5E	Amerada, Barlow 1	10,218	Comanche	Show oil in upper Tuscaloosa.
Copiah	8-9N-7E	White, Magnolia 1	10,226	Comanche	
Franklin	17-7N-5E	Amerada, Homochitto 1	10,793	Comanche	
Franklin	33-7N-1E	Placid, Crosby 1	10,690	Comanche	Control on E. flank of Cranfield field.
Hinds	7-5N-1W	Canterbury, Ball 1	6,150	Comanche	Southwest flank Jackson uplift.
Issaquena	3-13N-9W	Hunt, Robertshaw 1	6,021	Comanche	
Jasper	1-1N-12E	Sinclair, Clayton 1	6,832	"Massive sand"	
Jefferson	31-6N-18W	Sinclair, Newman 2	11,644	Comanche	
Davis					
Jones	20-0N-10W	Gulf, Graves et al. 1	7,455	Comanche	Developed graben fault system over Sandersville prospect. No showings.
Jones	16-9N-10W	"Gulf, Jones "C" 1	7,784	Comanche	
Jones	13-0N-10W	Gulf, Masonite "C" 1	7,341	Comanche	
Jones	25-8N-10W	Sinclair, Wausau 2	7,815	Comanche	High, dry test on faulted Myrick prospect.
Lauderdale	36-7N-17E	Lacy, Pickett 1	4,844	Comanche	
Lawrence	14-0N-20W	Sinclair, Riley 1	10,613	Comanche	
Madison	20-10N-4E	Roeser-Pendleton, Trolie 1	6,711	Comanche	Attempted SE. extension of Pickens fault-line production.
Madison	5-10N-4E	Carter, Nichols 1	6,571	Comanche	
Rankin	13-7N-4E	Phillips, Denkman 1	12,005	Cotton Valley	
Scott	26-6N-6E	Sinclair, Kirsch 1	7,511	Comanche	
Simpson	23-2N-5E	Gulf, Roberts 1	8,012	Comanche	
Smith	30-3N-6E	Goldston, Smith Co. 1	8,085	Comanche	
Smith	17-2N-7E	Hunt, Smith Co. 1	8,369	Comanche	
Stone	1-3S-11W	Morgan, Wilbe 1	8,505	"Massive sand"	
Warren	24-16N-4E	Magnolia, Ragsdale 1	10,649	Comanche	
Washington	7-14N-9W	Placid, Dr. Cooper 1	6,677	Cotton Valley?	
Wayne	9-0N-9W	Humble, G&O. B-1	7,216	Comanche	
Wayne	3-8N-6W	Southport, Evans 1	6,606	"Massive sand"	
Yazoo	29-12N-1E	Plains, King 1	7,316	Comanche	

TABLE VIII

Field	January	February	March	April	May	June	July	August	September	October	November	December	Total 1944	Accum. Total
Tinsley	1,171,240	1,054,741	1,006,957	1,036,100	1,034,370	987,836	965,049	948,076	905,103	883,452	864,660	854,800	11,802,564	76,848,513
Pickens	166,040	151,369	160,334	154,625	162,863	186,778	194,716	202,059	191,500	195,011	184,628	190,019	2,141,751	4,534,234
Heidelberg	1,000	8,276	11,467	23,330	28,134	67,559	130,070	156,685	203,108	246,292	273,250	292,803	1,442,053	1,442,053
Canfield	7,376	13,484	17,285	17,026	29,662	38,863	46,281	48,721	62,190	76,190	76,618	91,060	525,422	538,313
Bucetta	82	415	4,810	11,104	15,745	21,006	34,499	42,083	41,943	76,652	103,850	101,528	454,332	455,905
Croft	1,360	1,435	1,435	1,236	130	598	964	1,064	1,135	976	8,717	950	11,518	421,368
Maljieu	Discovery well completed August 1944								6,400	8,110	8,422	1,104	21,030	10,301
Brookhaven														
Flora	072	1,425	1,339		35	37	210	29	127	631	322	149	5,276	0,000
Grainville	Discovery well completed August, 1944													
Bartville	Discovery well completed November, 1944													
Cartage														
Font														
Total 1944	1,348,088	1,330,699	1,203,797	1,243,421	1,270,945	1,302,987	1,371,798	1,402,687	1,411,552	1,487,474	1,512,997	1,544,455	16,421,800	83,927,080

Note: Production figures from records of Mississippi State Oil and Gas Board.

Other than wells which have been discussed, there were a number of wildcats, all abandoned, which have been significant as related to local structural conditions or have contributed to subsurface information in Mississippi. These wells are tabulated in Table VII.

PRODUCTION

Production during 1944 in Mississippi showed a decline of 2,357,394 barrels below figures for 1943. This decrease was due entirely to loss in potential of wells in the Tinsley field, Yazoo County, for new production was not able to offset the decline at Tinsley until May, 1944.

Table VIII gives 1944 monthly production figures for all Mississippi fields, with annual and accumulative totals for each.

EXPLORATION

Geophysical, core-drill, and soil-analysis exploration showed an increase from a total of 1,200 crew-weeks work in 1943 to 3,090 crew-weeks in 1944. Although complete statistics on the United States are not available, it is certain that Mississippi will be one of the leading states in geophysical exploration.

Although no attempt is made to divide the state into areas of comparative activity, practically all efforts have been concentrated in the south half.

Table IX provides a monthly record of crew-weeks worked by each method employed in Mississippi.

TABLE IX

	Core Drill	Gravity Meter	Magne- tometer	Seismo- graph	Soil Analysis	Total
January	7	37	3	116	0	163
February	12	49	4	128	0	193
March	15	70	5	167	3	260
April	12	54	4	149	4	223
May	15	83	6	190	5	299
June	12	80	8	142	4	246
July	9	80	7	151	4	251
August	15	92	5	198	5	315
September	12	73	1	170	4	260
October	16	75	0	170	4	265
November	17	99	0	213	5	334
December	13	90	0	186	1	290
Total 1944	155	882	43	1980	39	3090
Total 1943	54	299	28	819	0	1200

FUTURE PROSPECTS IN MISSISSIPPI

At the start of 1945 there were 36 wildcats in active operation in Mississippi. Two of them had cored and made preliminary tests on showings which indicate new field discoveries.

In the Langsdale area of Clarke County, the Kirby Petroleum Company's Long Bell Petroleum Company No. B-1, NW. $\frac{1}{4}$, NW. $\frac{1}{4}$, SW. $\frac{1}{4}$ of Sec. 30, T. 1 N.,

R. 18 E., cored oil showings in the upper Eutaw and perforated casing at 3,650-3,660, 3,707-3,717, and 3,729-3,739 feet. The well would not flow, and a pumping unit was being installed for an early completion in 1945.

In the Soso area, Jasper County, the Gulf Refining Company's Edwards-Bailey No. 1 cored and drill-stem tested a gas-condensate sand in the basal Eutaw from 6,586 to 6,630 feet. Drilling was to continue to test the "Massive sand" zone.

Two old producing areas, Cary and Tinsley, have in operation wells which are intended to test the Smackover limestone. The British-American Oil Producing Company is drilling F. B. Houston No. 3, Sec. 15, T. 11 N., R. 7 W., Sharkey County, in the Cary field; and the Union Producing Company is operating a joint venture on Jennie Stevens No. 21, Sec. 12, T. 10 N., R. 3 W., Yazoo County, in the Tinsley field.

There were 41 locations in operation developing the active producing areas in Baxterville, Cary, Cranfield, Eucutta, Gwinville, Heidelberg, Langsdale, Mallalieu, Pickens, and Tinsley.

The tremendous volume of geophysical work being done in Mississippi and the dimensions of the area now considered potentially productive indicate a period of even greater activity during 1945.

RECENT PUBLICATIONS AND PROJECTS

1. "General Geology of Mississippi," by Tom McGlothlin. *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 28, No. 1 (January, 1944).

Though a great deal of subsurface information has been obtained since completion of this paper, it still stands as the most comprehensive on the geology of Mississippi.

2. "Stratigraphy of Cotton Valley Beds of Northern Gulf Coastal Plain," by Frederick M. Swain. *Ibid.*, Vol. 28, No. 5 (May, 1944).

This paper deals with stratigraphy of the Cotton Valley beds of South Arkansas, North Louisiana, and East Texas; however, deep drilling in central and north-central Mississippi is causing an increased interest in this group of beds.

3. Structure of South Louisiana Deep-Seated Domes, by W. E. Wallace, Jr. *Ibid.*, Vol. 28, No. 9 (September, 1944).

This paper has been officially acclaimed one of the outstanding presentations of the year, and though it deals with specific data as revealed by study of South Louisiana deep-seated salt domes, the scope of its significance is unlimited.

4. "Oligocene Stratigraphy of Southeastern United States," by F. Stearns MacNeil. *Ibid.*, Vol. 28, No. 9 (September, 1944).

The paper presents views obtained from field work by United States Geological Survey on problems related to Oligocene stratigraphy.

5. "Regional Subsurface Stratigraphy and Structure of Florida and Southern Georgia," by Paul L. Applin and Esther R. Applin. *Ibid.*, Vol. 28, No. 12 (December, 1944).

A paper which draws on all available information in an area which has become increasingly significant.

6. "Mississippi Geological Map," prepared by the Mississippi Geological Society, with the coöperation of the United States Geological Survey. The map, incorporating work done by surface parties of oil companies and the United States Geological Survey, is a model of accuracy to other areas.

7. The United States Geological Survey has been working for several months in Alabama, attempting to subdivide properly the Tuscaloosa group into definite formational units. The Survey hopes that the surface subdivisions may be projected, as recognizable units, into the subsurface section.

GEOLOGICAL NOTES

NEW HOPE FIELD, FRANKLIN COUNTY, TEXAS¹

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Dallas, Texas

The New Hope field is in southeastern Franklin County, Texas, in the north-central part of the East Texas basin. It is approximately 20 miles south of the Talco field, which produces from the Paluxy sand, and 25 miles north of the Hawkins field, which produces from the Woodbine sand.

In the spring of 1941, the Tide Water Associated Oil Company and Seaboard Oil Company, operating jointly, employed the Independent Exploration Company to conduct a reconnaissance gravity survey of the north part of the East Texas basin. This survey revealed a broad, minimum-gravity anomaly in southern Franklin County which warranted further appraisal with the seismograph. Seismic Explorations, Incorporated, under contract to the Tide Water-Seaboard companies, at the time, succeeded in isolating a simple, anticlinal structure with a minimum closure of 125 feet. Subsequently, in June and July, 1941, a block of 6,700 acres was acquired on this structure by the two companies. The geophysical operations were carried on under the supervision of K. A. Schmidt, geologist, and E. S. Sherar, chief geophysicist, representing Tide Water Associated, and the writer, representing Seaboard.

The New Hope structure was originally considered as basically similar to that on which the Pittsburg field was located, 8 miles southeast. The Pittsburg field was not highly regarded as it was only a "one-pay" field, the anticipated recoveries were low for the depth (approximately 8,000 feet) to production, and most of the wells were placed on the pump immediately upon completion. In the summer of 1942, however, the Coke field was discovered 15 miles southwest of the New Hope prospect. Prolific high-gravity Paluxy oil production was revealed by the Coke discovery, thereby automatically attaching greater importance to the New Hope prospect. By a twist of geologic fate, however, New Hope failed to encounter any showings in the Paluxy or shallow Woodbine formations, but was proved productive in four separate zones in the lower Glen Rose and upper Travis Peak formations, or in three more zones than produce in the Pittsburg field.

The discovery well, the Tide Water Associated-Seaboard Oil Company's A. J. Bacon No. 1, 440 feet out of the northeast corner of the A. J. Bacon 122.49-acre tract in the John Maximillian Survey, was drilled to 8,089 feet, and dually

¹ Manuscript received, March 22, 1945.

² Chief geologist, Seaboard Oil Company of Delaware. The writer is indebted to Wayne V. Jones, chief geologist of the Tide Water Associated Oil Company, for assistance in preparing this paper, and to the managements of Tide Water Associated and Seaboard oil companies for permission to publish these data.

completed on April 15, 1943. Successful completions were made through perforations from 7,295 to 7,305 feet, opposite porous, oölitic limestone occurring immediately below the massive anhydrite, and through open hole from 7,900 to 8,089 feet in a sand section correlating with the producing zone of the Pittsburg field. The upper zone, referred to as the "Bacon limestone," flowed 347.8 barrels of 41.5° gravity oil per day through a 10/64-inch casing choke. The lower porous section, referred to as the "Pittsburg zone," flowed 208.7 barrels of 47° gravity oil per day through a 10/64-inch tubing choke.

Since the discovery, two additional sands have been proved productive, the "Hill sand" approximately 100-120 feet below the base of the massive anhydrite in the lower Glen Rose, and a sand of upper Travis Peak age, referred to as the "Elledge sand" about 250 feet below the top of the "Pittsburg zone." The first Hill sand completion was made in the C. D. Elledge No. 1 from perforations at 7,433-7,446 feet for 412 barrels of 45.3° gravity oil per day through a 10/64-inch choke, the first Elledge sand completion was made in the J. P. Campbell No. 1 from perforations at 8,156-8,190 feet for 205 barrels of 53° gravity oil per day through a 10/64-inch choke.

Subsurface markers in the discovery well by electrical log are as follows.

	<i>Depth below Surface (Feet)</i>	<i>Depth below Sea-Level (Feet)</i>
Top Nacatoch	1503	-1071
Top Pecan Gap	2350	-1918
Top Austin chalk	3640	-3208
Base Austin chalk	3735	-3303
Top Woodbine	4010	-3578
Top Georgetown	4635	-4203
Top Paluxy	5732	-5300
Top Glen Rose	6159	-5727
Top massive anhydrite	7128	-6696
Base massive anhydrite	7270	-6838
Bacon limestone	7273-7304	-6841-6872
Hill sand	7408-7428	-6976-6996
Pittsburg sand	7930-7966	-7498-7534
Elledge sand (estimated)	8180-8210	-7748-7778

Producing
zones

To date there are 29 dually completed producers and a single completion, 6 wells in the process of completion, and 6 drilling wells in the field. Approximately 1,500 acres have been proved productive in one or more zones and at least 1,000 acres more are regarded as semi-proved. Developments thus far have definitely established New Hope as a major oil field. Figure 1 shows development to date.

The oil-water contacts have been established within narrow limits in the three sandstone "pays." The water level has not been found in the Bacon limestone producing zone, which to date has a minimum producing relief of 107 feet.

From present subsurface data, the structure of the field is essentially that of a simple symmetrical anticline trending east and west. There are no indications whatever of faulting, or any abnormal structural irregularities. There are present in the field the usual local variations in porosity and permeability in the pay

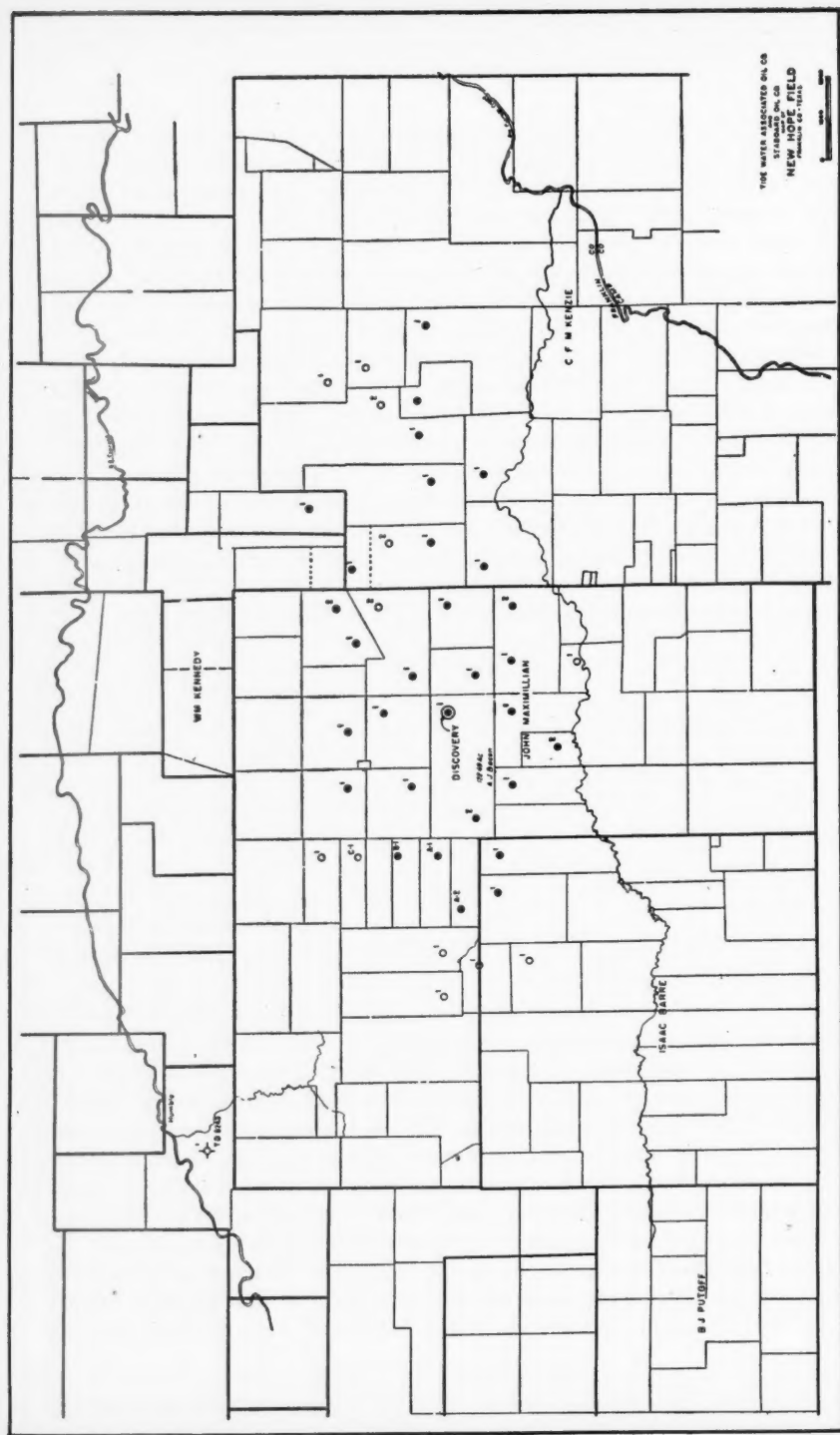


FIG. 1.—Sketch map showing development at New Hope field, Franklin County, Texas. Scale: approximately 1 inch equals 4,000 feet.

zones, which are present in most oil fields. No dry holes have been drilled within the present producing limits of the field, although a dry hole to 8,243 feet has been drilled 2 miles northwest of the discovery well. This dry hole ran approximately 200 feet lower than the discovery.

The field is being developed on a 40-acre spacing program and, with the exception of several leases on the west, is controlled by the Tide Water Associated and Seaboard oil companies.

BACON LIMESTONE, EAST TEXAS¹

WAYNE V. JONES²

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The Bacon limestone or, as it is more commonly called, the "Bacon lime" first came to the attention of the geologists of the East Texas region when the Tide Water Associated Oil Company and the Seaboard Oil Company dually completed their A. J. Bacon No. 1 in it and a zone locally referred to as the Pittsburg zone as the discovery well of the New Hope field, Franklin County, Texas. The beds which constitute the Bacon limestone had for some years been recognized as an individual unit and because of their electric-log characteristics had been referred to as the "false porosity" at the base of the massive anhydrite section of the Glen Rose sub-group of the Lower Cretaceous system. It is the purpose of this paper to define, describe, and accurately place in the section the Bacon limestone.

TYPE LOCALITY

On May 8, 1943, the Tide Water Associated Oil Company and the Seaboard Oil Company completed their A. J. Bacon No. 1, the discovery well of the New Hope field, in limestone, through perforations at 7,295-7,305 feet, producing initially 347.78 barrels of 43° gravity oil in 24 hours through 10/64-inch choke with tubing pressure of 750 pounds, casing pressure of 540 pounds, and gas-oil ratio of 231:1. The limestone member, of which this perforated interval is a part, extends from 7,287 to 7,312 feet. After consultation with Ray A. Stehr, chief geologist of Seaboard Oil Company, it was decided to name this limestone the Bacon limestone for this discovery well which is 440 feet south of the north line and 440 feet west of the east line of the A. J. Bacon 122.49-acre tract in the John Maxi-

¹ Manuscript received, April 12, 1945.

² Chief geologist, Tide Water Associated Oil Company. The writer expresses his appreciation to the managements of the Tide Water Associated Oil Company and of the Seaboard Oil Company for their permission to publish this paper; to Ray A. Stehr, chief geologist of Seaboard Oil Company, for helpful discussions; to L. K. Lancaster, Francis B. Stein, E. Phillips Whealdon, and H. Garland Fox, who gathered the field data on which this paper is based; and to William R. Allen who drafted Figure 1.

CORRELATION CHART OF FERRY LAKE FORMATION SHOWING BACON LIMESTONE MEMBER FRANKLIN AND CAMP COUNTIES, TEXAS

UPPER GLEN ROSE	UPPER GLEN ROSE FORM. AFTER IMLAY
MIDDLE GLEN ROSE	MIDDLE GLEN ROSE FORM.
RODESSA FORMATION	RODESSA FORMATION

TIDE WATER ASSOC. OIL CO.
& SEABOARD OIL CO.
No. 1 A. J. BACON
NEW HOPE FIELD
FRANKLIN COUNTY

TIDE WATER ASSOC. OIL CO.
& SEABOARD OIL CO.
No. 1 F. M. ANDERSON
NEW HOPE FIELD
FRANKLIN COUNTY

TIDE WATER ASSOC. OIL CO.
& SEABOARD OIL CO.
No. 1 FANNIE ROBERTS
CENTER POINT AREA
CAMP COUNTY

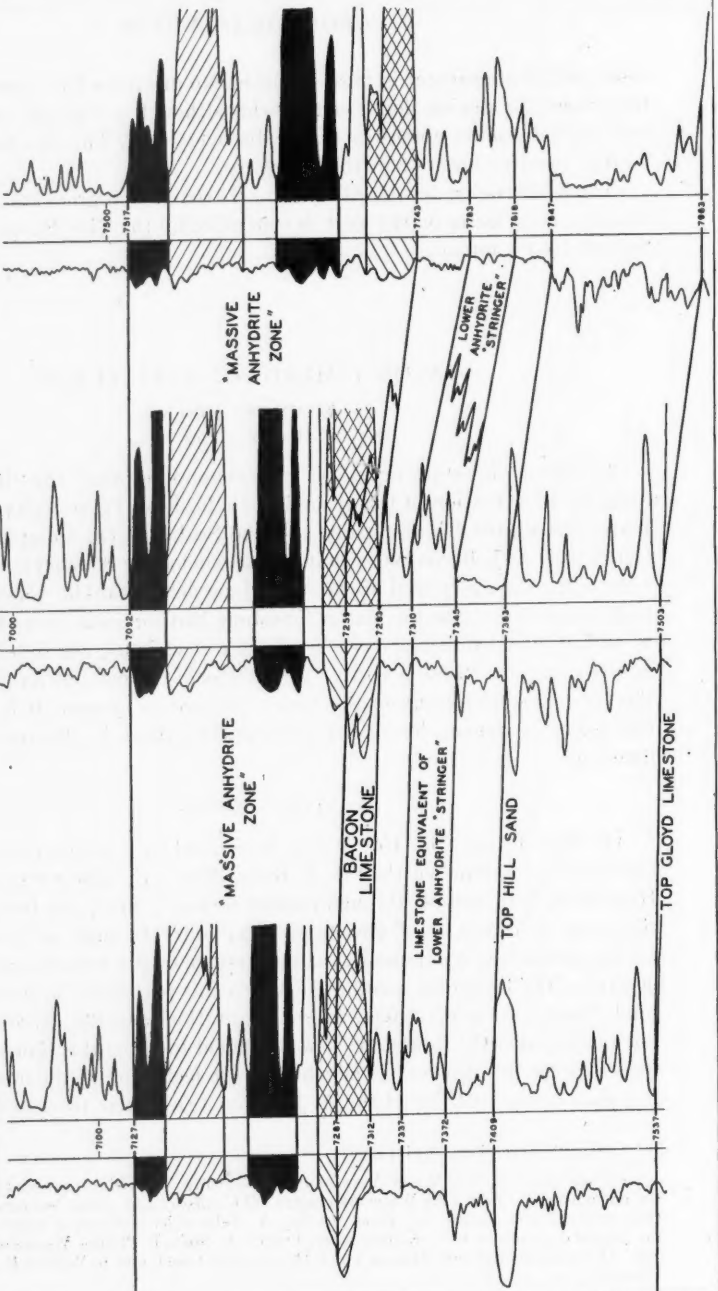


FIG. 1

million (Abstract 306) Survey in the southeastern part of Franklin County, Texas.

DESCRIPTION OF FORMATION

It is rather unfortunate that only the very basal part of the porosity in the Bacon limestone was cored in the discovery well. This core was described by L. K. Lancaster, at that time district geologist, for Tide Water Associated and Seaboard oil companies, as follows.

Core No. 13: 7,301-7,318 feet. Recovery 7 feet, 9 inches

Feet	Inches	
	9	Hard, dark gray stylolitic granular lime with a few spots bleeding light brown oil
1	3	Very porous fairly firm gray oölitic lime with good odor and taste of distillate and slight brownish stain
	3	Very dense hard shaly limestone
	6	Very hard dense dark gray granular lime w/no show
1	6	Hard, shaly lime and dark gray calcareous shale in alternating thin streaks
1	6	Very hard, fossiliferous, dark brownish gray granular lime with few pin-points bleeding, light brown, apparently high gravity oil
2		Very hard, dark gray, dense, shaly lime and calcareous shale, sulphur odor on some fresh breaks
		Coring time in minutes per foot: 8-6-6½-12½-16-11-14-14-14-12-14-27-13-22-24-32-43-34

With the aid of the coring time it is possible to place the recovered part of this core more accurately in the section than otherwise would be possible. The sharp break in the coring time at 7,304 feet coincides with the base of the porosity on the electric log (Fig. 1). The first 24 inches of the recovered core belongs in the interval 7,301-7,304 feet. The remaining 5 feet, 9 inches is from below 7,304 feet and probably is from above 7,312 feet and is most of the dense portion of the Bacon limestone as developed in this well.

Because the Bacon limestone was poorly cored in the type well, an alternate "type locality" is herein designated as the suite of cores recovered from the Tide Water Associated and Seaboard Oil Company's F. M. Anderson No. 1, 500 feet north of the south line and 440 feet west of the east line of the F. M. Anderson 1,025-acre tract in the C. F. McKenzie (Abstract 307) Survey, Franklin County, Texas.

F. M. Anderson No. 1 is 8,000 feet slightly north of east of A. J. Bacon No. 1. This suite of cores was described by E. P. Whealdon as follows.

Core No. 1: 7,245-7,256 feet. Recovery 10 feet

Feet	Inches	
3	6	Hard, dense gray, calcareous shale
6		White anhydrite with some gray to black shale partings
6		Hard, dense, gray calcareous shale
		Coring time: 28-30-28-25-27-25-22-20-23-19-21.

Core No. 2: 7,256-7,267 feet. Recovery 10 feet

8	2	White anhydrite with streaks of hard black shale
	6	Hard, gray to black shale
1	4	Firm, porous and permeable, fossiliferous, oölitic limestone with good odor and taste of distillate and good stain of oil (top of Bacon limestone)
		Coring time: 28-31-25-22-21-25-20-20-17-8.

Core No. 3: 7,267-7,276 feet. Recovery 5 feet

Feet	Inches	
2		Firm porous and permeable, oölitic, fossiliferous limestone, with good odor and taste of distillate and good oil stain
	8	Hard, oölitic to crystalline limestone with some bleeding pin-points of oil
	4	Firm, oölitic fossiliferous, porous and permeable limestone with odor and taste of distillate and good oil stain
	6	Hard, dense, oölitic to crystalline limestone with some bleeding pin-points of oil
1	6	Firm to fairly hard, porous and permeable, fossiliferous limestone with good odor and taste of distillate and good oil stain

Coring time: 7-11-15-12-15-22-10-10-6.

Core No. 4: 7,276-7,287 feet. Recovery 9 feet, 6 inches

6		Firm to fairly soft, porous and permeable, fossiliferous limestone with good odor and taste of distillate and good oil stain
	1	Hard, dense, light gray, crystalline limestone with bleeding pin-points of oil
	6	Hard, tight, oölitic, slightly porous lime with bleeding pin-points of oil
2		Hard, dense, gray, crystalline limestone with bleeding pin-points of oil

Coring time: 5-14-9-11-16-22-16-31-33-34-25.

The depths in the cores and on the electric log (Fig. 1) do not coincide. The cored top of the Bacon limestone at 7,265 feet, 6 inches, must be adjusted upward by 6 feet to fit the electric-log top of 7,259 feet, 6 inches. As a result of the adjustment, the bottom of core No. 4 is 2 feet above the base of the Bacon limestone.

In summary, the porous parts of the Bacon limestone typically consist of porous and permeable oölitic and fossiliferous limestone, and the non-porous parts typically consist of hard, dense, gray crystalline, or in places oölitic, limestone.

The Bacon limestone is variable in its development, even within the confines of the New Hope field. It varies in thickness from 18 to 28 feet. Its porous development varies in thickness from 2 to 24 feet.

CORRELATION

The Bacon limestone, where developed, is the basal member of the Ferry Lake formation³ of the Glen Rose sub-group of the Lower Cretaceous system. Imlay's original name for the Ferry Lake formation was Ferry Lake anhydrite. Since it is established in the present paper that the Bacon limestone is a member of the Ferry Lake, it seems more appropriate to alter the name to Ferry Lake formation. The name Ferry Lake, though in good standing, has not been in general use among petroleum geologists who have preferred to continue the use of the older, but less desirable term, "massive anhydrite zone."

The presence of the Bacon limestone as an economically important unit makes it still more desirable that the name "Ferry Lake" be put into common usage and that the term "massive anhydrite" be dropped. The "base of the massive anhydrite" is a commonly used datum for subsurface mapping and the datum is usually placed at the base of the anhydrite as developed in the well or at the

³ R. W. Imlay, "Lower Cretaceous and Jurassic Formations of Southern Arkansas and Their Oil and Gas Possibilities," *Arkansas Geol. Survey Inform. Circ. 12* (1940 a), p. 6.

location in question. The actual base of the anhydrite, however, does not maintain a uniform stratigraphic position but rises in the section wherever the Bacon limestone is developed. In these areas the base of the Bacon limestone is the stratigraphic equivalent of the base of the massive anhydrite in those areas where there is no Bacon limestone. The difficulty and confusion inherent in this situation are overcome when the name "Ferry Lake formation" is substituted for the term "massive anhydrite zone" since the name "Ferry Lake formation" has no connotation as to the lithology of the beds. The Bacon limestone then becomes the occasionally developed basal member of the Ferry Lake formation.

Figure 1 brings out the detailed correlation of the Ferry Lake formation in the New Hope field and compares it with the more typical development of the formation as encountered in Tide Water Associated Oil-Seaboard Oil Company's Fannie Roberts No. 1, 630 feet from the west line and 467 feet from the north line of the 150-acre Roberts tract in the Obediah Hendricks (Abstract 57) Survey near the town of Center Point in southeastern Camp County, Texas. Several electrically distinctive members of the Ferry Lake formation are differentially shaded in Figure 1 to emphasize the correlations.

The electric logs are adequate to establish the equivalency of the beds in the three wells but the cores from Fannie Roberts No. 1 are needed to bring out the point that the Bacon limestone where it is developed is replacing anhydrite of the typical Ferry Lake section. The following description of the pertinent cores from Fannie Roberts No. 1 is by E. P. Whealdon.

Core No. 11: 7,685-7,696 feet. Recovery 11 feet

Feet Inches

- | | | |
|---|---|-----------------------|
| 4 | | Black ring-tail shale |
| 4 | | White anhydrite |
| | 6 | Black ring-tail shale |
| 2 | 6 | White anhydrite |
- Coring time: 25-12-13-19-20-25-18-30-18-11-13.

Core No. 12: 7,696-7,706 feet. Recovery 8 feet, 2 inches.

- | | | |
|---|---|-----------------------------------------------------|
| 8 | 2 | White anhydrite with some thin seams of black shale |
|---|---|-----------------------------------------------------|
- Coring time: 12-10-10-10-12-12-12-15-16-11.

Core No. 13: 7,706-7,722 feet. Recovery 12 feet.

- | | | |
|----|---|-----------------------------------------------------------------------|
| 10 | | White anhydrite |
| | 6 | Hard, dense gray crystalline limestone with some anhydrite inclusions |
| 1 | 6 | Anhydrite |
- Coring time: 10-10-10-12-13-13-12-13-13-14-15-15-15-15-18-17.

Core No. 14: 7,722-7,736 feet. Recovery 12 feet

- | | | |
|----|--|-----------------|
| 12 | | White anhydrite |
|----|--|-----------------|
- Coring time: 10-10-10-15-15-12-13-10-10-11-11-11-15.
- Drilled 7,736-7,737 feet

Core No. 15: 7,737-7,744 feet. Recovery 3 feet, 6 inches

- | | | |
|---|---|-----------------|
| 3 | 6 | White anhydrite |
|---|---|-----------------|
- Coring time: 14-13-20-26-34-26-19.

The coring time places the base of the massive anhydrite, and the base of the Ferry Lake formation, at 7,743 feet.

Core No. 16: 7,744-7,749 feet. Recovery 4 feet

Feet	Inches	
	6	Hard, dense, fine-grained, brown sandstone with calcareous cement
3	6	Hard, dense calcareous shale
		Coring time: 36-29-30-34-41.

Core No. 17: 7,749-7,759 feet. Recovery 5 feet

1	6	Hard, dense, dark gray to black, fossiliferous, crystalline, shaly limestone
3	6	Hard, dense, black, calcareous, ring-tail shale
		Coring time: 25-25-20-22-23-32-32-31-25-27.

Core No. 18: 7,759-7,771 feet. Recovery 3 feet

3		Hard, dense black shale
		Coring time: 41-34-42-43-29-27-25-22-20-19-26.

Core No. 19: 7,795-7,804 feet. Recovery 7 feet

7		White anhydrite with 4 feet of black shale 4 inches from top of core (lower anhydrite stringer)
		Coring time: 15-16-16-15-14-15-15-15-17.

The presence of the typical lower anhydrite stringer in Fannie Roberts No. 1 further serves to place the section precisely in the stratigraphic column and brings out the close equivalence of the Bacon limestone to the Kilpatrick zone of the Sugar Creek field of Claiborne Parish, Louisiana.⁴

OTHER BACON LIMESTONE FIELDS

Prior to the discovery of the New Hope field and to the realization that the Bacon limestone constitutes an important objective, the Bacon limestone was productive both in the Cayuga field in Anderson County and in the Tri-Cities field in Henderson County. In each field the Bacon limestone is the uppermost member of the producing beds of Glen Rose age. The producing beds in these fields have been called variously "Trinity," "Glen Rose," and "Rodessa zone." Actually they are a combination of beds of Bacon limestone and Hill sand age. Because the Bacon limestone was grouped with the underlying beds as a part of a producing zone in these fields, their discovery occasioned no definite search for Bacon limestone production.

Since the discovery of oil in the Bacon limestone in the New Hope field, it has become one of the objectives of East Texas wildcat tests with the results that three additional Bacon limestone discoveries have been made. The next Bacon limestone discovery was by the Gulf Oil Corporation, when it completed K. C. Brewer *et al.* No. 1, through perforations at 7,990-8,014 feet as the discovery well of the Winnsboro field, producing initially 230 barrels of 41.4° gravity oil per day on $\frac{1}{8}$ -inch and 5/32-inch chokes, with tubing pressure of 750 pounds, casing pressure of 1,250 pounds, and gas-oil ratio of 1,095:1. This well is located one mile southwest of the town of Winnsboro, 610 feet from the west line and 722 feet from the north line of the 74-acre Brewer tract in the Benjamin Lee (Abstract 376) Survey, Wood County, Texas.

⁴ C. C. Clark, "Sugar Creek Field, Claiborne Parish, Louisiana," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 22, No. 11 (November, 1938), p. 1513.

The next Bacon limestone discovery was by the Humble Oil and Refining Company, when it completed C. B. Nichols *et al.* No. 1 as the discovery well of the Pickton field through perforations at 7,888-7,896 feet, producing initially 620 barrels of 50.2° gravity oil per day through $\frac{1}{4}$ -inch choke, with tubing pressure of 1,710 pounds, casing pressure of 1,825 pounds, and gas-oil ratio of 1,349:1. This well is 2 miles south of the town of Pickton in southern Hopkins County, Texas, 900 feet south of the north line and 660 feet west of the east line of the I. Fiddle (Abstract 333) Survey.

The most recent Bacon limestone discovery was by the Lone Star Producing Company, when it completed R. H. Lee No. 1, through perforations at 8,198-8,208 feet as the discovery well of the LaRue field, producing initially 261.74 barrels of 47.8° gravity oil per day through $\frac{5}{32}$ -inch choke with tubing pressure of 1,570 pounds, casing pressure of 2,475 pounds, and gas-oil ratio of 1,513:1. This well is $2\frac{1}{2}$ miles north of the town of Athens in Henderson County, Texas, 660 feet from the east line and 660 feet from the north line of the B. C. Walters Survey.

REVIEWS AND NEW PUBLICATIONS

* Subjects indicated by asterisk are in the Association library, and are available, for loan, to members and associates.

SYMPOSIUM ON LOESS, C. B. SCHULTZ AND M. K. ELIAS, CHAIRMEN

REVIEW BY CLIFFORD ADAMS¹

Rockville, Indiana

**Symposium on Loess.* A topic at the Earth Science Section of the Nebraska Academy of Science in 1944 under the co-chairmanship of C. B. Schultz and M. K. Elias. 10 papers by 12 authors. *Amer. Jour. Sci.*, Vol. 243; No. 5 (New Haven, Connecticut, May, 1945), pp. 225-303; illus.

The May, 1945, issue of the *American Journal of Science* is devoted entirely to a symposium on loess. The papers, ten in number, prefaced by a foreword by M. K. Elias, represent the major portion of the proceedings of a conference which met in Lincoln, Nebraska, under the auspices of the Earth Science Section of the Nebraska Academy of Science in 1944. Contributions by eminent geologists, both American and foreign, place within this single volume the fruits of a wide experience with and study of wind-blown deposits. The problem of loess is approached from the points of view of origin, types, distribution, and economic and cultural significance. Special attention is accorded the occurrences of Nebraska, the eastern slopes of the Rocky Mountains, and the great loess regions of the Middle West. The importance of loess in soil science is presented by representatives of the United States Department of Agriculture. Use of loess in road-building is discussed by highway engineers.

Each paper is preceded by an abstract and four of the articles are followed by discussions. Short bibliographies also follow most of the articles. The symposium is adequately illustrated. These papers constitute a good review of the loess problem and at the same time a preview of the uses that may be made of such eolian deposits in the future.

RECENT PUBLICATIONS

ALASKA

"Petroleum Possibilities in the Katalla Area, Alaska," by Don J. Miller, Darwin L. Rossman, and Charles A. Hickcox. *U. S. Geol. Survey* (May, 1945). A map on scale of 1 inch equals $\frac{1}{2}$ mile includes 8 geologic structure sections and a columnar section; accompanied by a text of 18 pp. Obtainable from the Director of the Geological Survey, Washington 25, D. C. Price, \$0.75.

ALBERTA

"Regional Structural Features of the Alberta Foothills and Adjacent Mountain Ranges," by Ralph L. Rutherford. *Trans. Royal Soc. Canada*, 3d Ser., Vol. 38, Sec. 4 (Ottawa, Canada, 1944), pp. 71-77; 1 fig.

ARGENTINA

*"Origen, evolución y futuro de la geofísica en la búsqueda del petróleo" (Origin, Evolution, and Future of Geophysics in the Search for Petroleum), by Pedro Rey. *Bol. Informaciones Petroleras*, Vol. 22, No. 245 (Buenos Aires, January, 1945), pp. 3-15; 11 figs. In Spanish.

*"Tectonica de estructuras fuertemente comprimidas" (Tectonics of highly Folded Structure), by Juan J. Zunino. *Ibid.* pp. 17-35; 8 figs.

¹ 505 East Indiana Street. Review received, May 21, 1945.

BOLIVIA

*"Resena sobre la Industria Petrolifera de Bolivia" (Review of the Petroleum Industry of Bolivia), by Guillermo Mariaco. *Bol. Inst. Sudamericano Petroleo*, Vol. 1, No. 5 (Av. Agraciada 1464, Montevideo, Uruguay, February, 1945), pp. 502-46, illus. In Spanish.

BRAZIL

*"Brazil's Oil," by Victor J. Oppenheim. *Oil Weekly*, Vol. 117, No. 6 (Houston, April 9, 1945), pp. 60-6.

CALIFORNIA

*"Lithology of the Sea Floor off Southern California," by K. O. Emery and F. P. Shepard. *Bull. Geol. Soc. America*, Vol. 56, No. 4 (New York, April, 1945), pp. 431-78; 3 pls., 1 fig.

"Southeastern Part of Midway-Sunset Oil Field, California," by W. T. Woodward. *U. S. Geol. Survey Prelim. Map 30*, Oil and Gas Inves. Ser. (May, 1945). Sheet, 44 X 50 inches. Four maps on scale of 1 inch equals 2,000 feet. Two sections on scale of 1 inch equals 1,000 feet, and an electric log diagram on scale of 1 inch equals 100 feet. Brief text is printed on same sheet. Obtainable from Director of Geological Survey, Washington 25, D. C., and from Room 533, U. S. Post Office and Courthouse Building, Los Angeles, California. Price, \$0.50.

CANADA

*"Geological Map of the Dominion of Canada." *Canada Bur. Mines and Geol. Map 820A* (Ottawa, 1945). 2 sheets, each approx. 32 X 43 inches. Scale: 1 inch equals 60 miles. In colors. Constructed on a Lambert's conformal conic projection, with the center meridian at 90° and two standard parallels at 47° 30' and 65° 30' to give a maximum of accuracy and balance, the map is in two sheets, a western and an eastern, and embraces all of the Dominion to Latitude 75° North. This includes most of the Canadian Arctic Islands and the remainder are shown in an inset on a scale of 1 inch equals 100 miles. The western sheet carries the main legend and the explanatory notes, and the eastern, the title, scale, and Arctic inset. Orders for copies should be addressed to the Chief, Bureau of Geology and Topography, Department of Mines and Resources, Ottawa. Price, \$0.50 for unmounted sets, or \$0.25 for either sheet (west or east).

CHILE

*"El Petroleo en Chile" (Petroleum in Chile), by Osvaldo Wenzel. *Bol. Inst. Sudamericano Petroleo*, Vol. 1, No. 5 (Av. Agraciada 1464, Montevideo, Uruguay, February, 1945), pp. 562-75, illus.

ECUADOR

*"Bosquejos de la geologia del Oriente Ecuatoriano" (Notes on the Geology of Eastern Ecuador), by H. J. Tschopp. *Bol. Inst. Sudamericano Petroleo*, Vol. 1, No. 5 (Av. Agraciada 1464, Montevideo, Uruguay, February, 1945), pp. 466-84; 2 figs. In Spanish.

EGYPT

*"Northern Egypt. Test Drilling Starts Long-Awaited Campaign," by Don L. Carroll. *Oil Weekly*, Vol. 117, No. 7 (Houston, April 16, 1945), pp. 44-45, 49; map and section.

ENGLAND

*"Petroleum in England," by C. A. P. Southwell. *Jour. Inst. Petroleum*, Vol. 31, No. 254 (London, February, 1945), pp. 27-39; 4 photographs.

GENERAL

*"How to Judge Geophysical Methods," by W. M. Rust, Jr., *Oil Weekly*, Vol. 117, No. 6 (Houston, April 9, 1945), pp. 56-57, 70.

*"Marine Bottom Samples Collected in the Pacific Ocean by the Carnegie on Its Seventh Cruise," by Roger R. Revelle. Together with "Radium Content of Ocean-Bottom Sediments," by Charles S. Piggot. *Carnegie Inst.* (Washington, D. C., 1945). 196 pp., paper, illus. Price, \$2.00.

*"Quantity Interpretation of Gravity Meter Surveys," by Sylvain J. Pirson. *Oil Weekly*, Vol. 117, No. 7 (Houston, April 16, 1945), pp. 34-36, 42; 3 figs.

*"Military Geology Has Rendered Vital Service in Conduct of War," by Ruth Sheldon. *World Petroleum*, Vol. 16, No. 4 (New York, April, 1945), pp. 42-44; illus.

*"Paleontology in the Post-War World," by B. F. Howell. *Bull. Geol. Soc. America*, Vol. 56, No. 4 (New York, April, 1945), pp. 371-84.

*"History of Geology in Graphical Presentation," by Ernst Cloos. *Ibid.*, pp. 385-88; 2 pls.

*"Correlation of Atlantic Coastal Plain Cenozoic Formations: a Discussion," by Horace G. Richards. *Ibid.*, pp. 389-400.

*"Report of A.P.I. Committee on Reserves for 1944." *A.P.I. Quar.*, Vol. 15, No. 2 (New York, April, 1945), pp. 35-38.

*"Review of Petroleum Geology in 1944," by F. M. Van Tuyl, W. S. Levings, et al. *Quar. Colorado School of Mines*, Vol. 40, No. 2 (Golden, Colorado, April, 1945). 136 pp., 3 photographs, 3 figs. Sponsored by research committee of A.A.P.G. Price, \$1.00.

**Symposium on Loess*. A topic at the Earth Science Section of the Nebraska Academy of Science in 1944 under the co-chairmanship of C. B. Schultz and M. K. Elias. 10 papers by 12 authors. *Amer. Jour. Sci.*, Vol. 243, No. 5 (New Haven, Connecticut, May, 1945), pp. 225-303; illus.

*"Mathematical Chance of Finding Oil," by V. G. Gabriel. *Oil Weekly*, Vol. 117, No. 12 (Houston, May 21, 1945), pp. 49-50, 56; 2 tables.

INDIA

*"Microfossils and Problems of Salt Range Geology," by B. Sahni. *Proc. Nat. Acad. Sci. India*, Vol. 14, No. 6 (1944; issued February 24, 1945), pp. i-xxxii; 17 text figs., 2 pls. (5 photographs of mine cuts and rock exposures). Presidential address before National Academy of Sciences, December 29, 1944. Author is professor of botany, University of Lucknow.

KANSAS

*"Problems of Pleistocene Stratigraphy in Central and Western Kansas," by John C. Frye. *Jour. Geol.*, Vol. 53, No. 2 (Chicago, March, 1945), pp. 73-93.

MICHIGAN

"Geology and Oil and Gas Possibilities of Trenton and Black River Limestones of the Michigan Basin, Michigan, and Adjacent Areas," by George V. Cohee. *U. S. Geol. Survey Prelim. Chart 11*, Oil and Gas Inves. Ser. (May, 1945). One sheet, 35×40 inches. Two subsurface sections on vertical scale of 1 inch equals 200 feet, and a stratigraphic diagram. Three small maps, on scale of 1 inch equals 75 miles, show generalized structure contours, equal-thickness contours, and areal geology. Brief text is printed on the sheet. Obtainable from the Director of the Geological Survey, Washington 25, D. C., and from the Geological Survey Division, State Department of Conservation, Michigan 13, Lansing, Michigan. Price, \$0.30.

"Geology and Oil and Gas Possibilities of Sylvania and Bois Blanc Formations in Michigan," by K. K. Landes. *U. S. Geol. Survey Prelim. Map 28*, Oil and Gas Inves. Ser.

(May, 1945). Single sheet, 44 × 56 inches. Contains 4 maps on scale of 1 inch equals 16 miles showing formational thickness and structural contours. A smaller map shows distribution of formations. Two cross sections and a stratigraphic column. Obtainable from Director of the Geological Survey, Washington 25, D. C., and from the Michigan Geological Survey Division, Lansing 13, Michigan. Price, \$0.40.

NEW MEXICO

*"Geologic Literature of New Mexico through 1944," by Robert L. Bates and Marian R. Burks. *New Mexico Bur. Mines and Min. Resources Bull.* 22 (Socorro, 1945). 147 pp.

OKLAHOMA

"A Study of the Secondary Recovery Possibilities of the Hogshooter Field, Washington County, Oklahoma," by I. W. Fox, C. H. Thigpen, R. L. Ginter, and G. P. Alden. *U. S. Geol. Survey*. First of a series of informal reports. Multigraphed. Copies obtainable from the Oil and Gas Supervisor, Federal Building, Tulsa, Oklahoma.

PENNSYLVANIA

**"Oil-Bearing Sands in Southwestern Pennsylvania," by L. S. Matteson and D. A. Busch. *Pennsylvania Geol. Survey, 4th Ser., Spec. Bull.* 1 (Harrisburg, 1944). 16 pp., 55 pls. (correlation sections and maps). Folio format. 12.5 × 15 inches. Heavy paper covers.

ROCKY MOUNTAINS

The Rocky Mountain Petroleum Year Book for 1944. "A complete résumé of oil and gas operations in Wyoming, Colorado, Montana, and New Mexico." Contains geologic maps and summaries. The Petroleum Publishers, Inc., 708 Seventeenth Street, Denver 2, Colorado. Price, \$5.00, postpaid.

SOUTH MID-CONTINENT

*"The Red Beds and the Anadarko Basin," by Charles N. Gould. *Oil Weekly*, Vol. 117, No. 12 (Houston, May 21, 1945), pp. 59-64; 3 figs.

UTAH

**"Post-Wasatch Tertiary Formations in Southwestern Utah," by Herbert E. Gregory. *Jour. Geol.*, Vol. 53, No. 2 (Chicago, March, 1945), pp. 105-15; 13 figs.

VIRGINIA

*"Selected Well Logs in the Virginia Coastal Plain North of James River," by D. J. Cederstrom. *Virginia Geol. Survey Cir.* 3 (University, 1945). 82 pp., 1 fig. Prepared in cooperation with the United States Geological Survey.

WYOMING

"Wells Drilled for Oil and Gas in Wyoming." *U. S. Geol. Survey* (May, 1945). "The Geological Survey, cooperatively with 12 oil companies, who contributed the additional assistance necessary to compile drilling records in the files of the Oil and Gas Leasing Division at Casper, Wyoming, has published a tabular listing of all wells drilled for oil and gas in Wyoming. The compilation . . . comprises some 286 pages of historical data, complete with well-record legend, list of abbreviations, and reference map." A limited number are available and obtainable from the Oil and Gas Supervisor, Box 400, Casper, Wyoming.

ASSOCIATION DIVISION OF PALEONTOLOGY AND MINERALOGY

**Journal of Paleontology* (Tulsa, Oklahoma), Vol. 19, No. 2 (March, 1945)

"A Contribution to Ostracodal Ontogeny," by L. W. LeRoy

"Ostracoda of the Plum Brook Shale, Erie County, Ohio," by Grace Anne Stewart and William Edwin Hendrix

"Ostracoda of the Olenitangy Shale, Franklin and Delaware Counties, Ohio," by Grace Anne Stewart and William Edwin Hendrix

"*Bicorbula*, a New Permian Bryozoan, probably a Bryozoan-algal Consortium," by G. E. Condra and M. K. Elias

"A New Genus of early Paleozoic Cephalopods from Alaska," by A. K. Miller and Bernard Kummel

"Diagnostic Foraminifera from Subsurface Formations in Florida," by E. R. Applin and Louise Jordan

"*Stigmatella* in the Ordovician of the Central Ontario Basin," by H. S. Armstrong

"Problems of Speciation and Correlation as Applied to Mollusks of the Marine Cenozoic," by Bruce L. Clark

**Journal of Paleontology* (Tulsa, Oklahoma), Vol. 19, No. 3 (May, 1945)

"The Brachiopod Zonal Indices of the Stages Costonian to Onnian in Britain," by B. B. Bancroft

"Jurassic Fossils from the Southern States, No. 2," by Ralph W. Imlay

"Ammonites from the Dierks Limestone of Southern Arkansas," by Ralph W. Imlay

"Permian Nautiloids from the Glass Mountains and the Sierra Diablo of West Texas," by A. K. Miller

"*Protodonax*, a New Cretaceous Molluscan Genus," by H. E. Vokes

"Corals from the Post-Osage Mississippian of Montana," by Laurence L. Sloss

"A Neogene Stickleback from the Ridge Formation of California," by Lore Rose David

**Journal of Sedimentary Petrology* (Tulsa, Oklahoma), Vol. 15, No. 1 (April, 1945)

"Shape Variation of Some Lake Superior Beach Pebbles," by Robert M. Grogan

"Heavy Black Sands on Some Victorian Beaches," by George Baker

"Unusual Nuclei in Oölites from the Morrow Group near Fayetteville, Arkansas," by Lloyd G. Henbest

"Clay-Pellet Conglomerates at Hobart Butte, Lane County, Oregon," by Victor T. Allen and Robert L. Nichols

THE ASSOCIATION ROUND TABLE

MEMBERSHIP APPLICATIONS APPROVED FOR PUBLICATION

The executive committee has approved for publication the names of the following candidates for membership in the Association. This does not constitute an election but places the names before the membership at large. If any member has information bearing on the qualifications of these nominees, he should send it promptly to the Executive Committee, Box 979, Tulsa 1, Oklahoma. (Names of sponsors are placed beneath the name of each nominee.)

FOR ACTIVE MEMBERSHIP

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Hugh D. Miser, Carle H. Dane, William G. Pierce
Joseph William Barbisch, San Antonio, Tex.
Van A. Petty, Jr., P. J. Rudolph, Marion J. Moore
Evan Hughes Burtner, Taft, Calif.
H. W. Weddle, R. G. Reese, B. R. Ellison
William Ferdinand Cerini, San Gabriel, Calif.
John E. Sherborne, Harvey W. Lee, E. R. Atwill
Roswell Dale Clark, Duncan, Okla.
George B. Rice, Joseph M. Wilson, Frank Gouin
Robert Davis Ford, Long Beach, Calif.
Downs McCloskey, Hampton Smith, Richard R. Crandall
Maurice Gordon Frey, New Orleans, La.
L. I. Brown, Earle R. Wall, K. H. Crandall
Siegfried William Fruehling, Tulsa, Okla.
R. W. Mossman, Stanley W. Wilcox, A. J. Barthelmes
Lee Wilbur Gibson, Houston, Tex.
Perry Olcott, Douglas E. Bell, F. M. Van Tuyt
James Franklin Johnson, Fort Worth, Tex.
Gordon Atwater, E. L. Earl, J. O. Hoard
Aubrey Britton McCollum, Tulsa, Okla.
Glenn S. Dille, W. Reese Dillard, G. M. Kridler
Luther Orlando Naffziger, Tulsa, Okla.
Frederic A. Bush, R. M. Gawthrop, Harry D. Yountman
Victor Edwin Peterson, Midland, Tex.
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Garland Peyton, Atlanta, Ga.
Herman Gunter, H. G. Walter, Robert H. Dott
Lee E. Phillips, Jr., Wichita, Kan.
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Charles Milburn Sampson, Freeport, Tex.
W. B. Milton, Jr., M. M. Sheets, H. C. Petersen
Sebron Lloyd Stoneham, McAllen, Tex.
John A. Young, L. C. Smith, J. W. Minton
Gordon Ashbridge White, Washington, D. C.
Carl H. Gerdes, A. C. Waters, A. L. Lugin

FOR ASSOCIATE MEMBERSHIP

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Waitus Kay Denham, Jr., Goliad, Tex.
F. L. Whitney, Fred M. Bullard, Harry H. Power
John Frendberg Durr, Hutchinson, Kan.
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Arthur M. Hull, Galveston, Tex.
S. W. Lowman, W. S. Adkins, Marcus A. Hanna
Stanley Rex Jeffreys, Sacramento, Calif.
M. G. Edwards, Frank W. Bell, W. E. McKittrick
Frank Albert Morgan, Jr., Casper, Wyo.
F. M. Van Tuyl, H. W. Hoots, Frank A. Morgan, Sr.
George H. Rohrer, Mountain Lakes, N. J.
A. T. Schwennesen, F. W. Bartlett, E. Jablonski
Charles Augustus Steen, Lima, Peru, S. A.
E. Jablonski, L. A. Nelson, Walton Sumner
Pat Kennedy Sutherland, Norman, Okla.
V. E. Monnett, Charles E. Decker, C. G. Lalicker

FOR TRANSFER TO ACTIVE MEMBERSHIP

- Robert B. Baum, Tulsa, Okla.
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Benjamin Angel Daleon, Los Angeles, Calif.
J. M. Hamill, Boris Laiming, James R. Dorrance
Willard Lyle Dockery, Tyler, Tex.
John L. Brown, George A. Weaver, Lynn K. Lee
Allan Dexter Graves, Bogota, Colombia, S. A.
Philip Andrews, J. A. Tong, W. C. Hatfield
William C. Hawk, Ventura, Calif.
Glenn H. Bowes, R. M. Barnes, Richard Ten Eyck
Neal Johnstone Smith, New Orleans, La.
Leonard I. Brown, Earle R. Wall, Kenneth H. Crandall
Wade W. Turnbull, Mattoon, Ill.
J. Peter Smith, Lee C. Lamar, R. M. English

AT HOME AND ABROAD

CURRENT NEWS AND PERSONAL ITEMS OF THE PROFESSION

FRANK B. NOTESTEIN, of the Foreign Production Division of the Petroleum Administration for War, was injured in a plane crash near Casablanca, North Africa, in February. He is recuperating at his home, 1727 Burbank Road, Wooster, Ohio.

An oil-painting portrait of ARTHUR CARLETON TROWBRIDGE was presented by his students and colleagues to the University of Iowa, April 9. The presentation was made by E. HAZEN WOODS, of Midland, Texas, and the portrait was accepted by president VIRGIL M. HANCHER. A. K. MILLER presided at the presentation dinner and ceremony. Trowbridge has been professor of geology at the University since 1911 and head of the department of geology, director of the Iowa Geological Survey, and State geologist since 1934.

W. G. WENDER, formerly with the Normandie Oil Company, Houston, Texas, is now with the N.W. Wheless Oil Company, Shreveport, Louisiana.

JAMES H. MCGUIRT, formerly with the Magnolia Petroleum Company, is in the employ of the Tide Water Associated Oil Company as southeast Texas district geologist at Houston, Texas.

WILLIAM A. ROMANS, Box 168, Baton Rouge, Louisiana, is field superintendent for F. A. Callery of Fort Worth, Texas, operating in Texas and Louisiana.

LOUIE C. KIRBY is a geologist with the Stanolind Oil and Gas Company. He may be addressed at Box 1633, Oklahoma City, Oklahoma.

FRANK W. REEVES is with the Lucerne Corporation, Republic Bank Building, Dallas, Texas.

STAFFORD PARK has resigned his position with the Eastman Oil Well Survey Corporation to make a connection with the Beloil Corporation, Long Beach, California.

S. GRACE HOWER, recently resigned from the Seismograph Service Corporation, is now with the Amerada Petroleum Corporation, Tulsa, Oklahoma.

C. V. MILLIKAN, chief engineer of the Amerada Petroleum Corporation, has been elected president of the Engineers Club of Tulsa, Oklahoma.

EUGENE A. STEPHENSON, director of the University of Kansas Research Foundation, Lawrence talked before the Engineers Club of Tulsa, May 21, on "A New Process for the Exclusion of Water from Oil Wells."

The American Petroleum Institute committee on petroleum reserves estimates that the proved reserves of crude oil in the United States as of December 31, 1944, amounted to 20,453,231,000 barrels. This is an increase in reserves since December 31, 1943, of 389,079,000 barrels. The members of the committee are the following.

J. EDGAR PEW, chairman, Sun Oil Company, Philadelphia

R. F. BAKER, The Texas Company, New York

D. V. CARTER, Magnolia Petroleum Company, Dallas

FRANK R. CLARK, Ohio Oil Company, Tulsa

ALEXANDER DEUSSEN, Houston

G. CLARK GESTER, Standard Oil Company of California, San Francisco

F. H. LAHEE, Sun Oil Company, Dallas

J. M. SANDS, Phillips Petroleum Company, Bartlesville

FRED VAN COVERN, American Petroleum Institute, New York

THERON WASSON, Pure Oil Company, Chicago

FRED E. WOOD, Standard Oil Company (Indiana) Chicago

E. WAYNE GALLIHER, chief geologist of the Barnsdall Oil Company, Los Angeles, California, died from the accidental discharge of a gun he was examining, May 3.

DOUGLAS A. GREIG, who has recently been in Government service in Washington, D. C., has returned to geological work in New York and may be addressed c/o Standard Oil Company (New Jersey), Room 2150, 30 Rockefeller Plaza, New York.

Lieutenant SHERMAN A. WENGERD has been ordered in from the Pacific fleets to join the United States Naval Petroleum Reserves as geologist and geophysicist. This new billet brings him back to geology after experience over the Arctic and western Pacific since 1942 when he was commissioned in the Navy. Wengerd was formerly with the Shell Oil Company, Inc., Tulsa, Oklahoma. His address is 729 Nineteenth Street, NW., Washington, D. C.

Lieutenant Colonel HUBERT G. SCHENCK, at present in the Philippine Islands, has been elected a vice-president of the Société Géologique de France. His overseas address is A.P.O. 500, c/o Postmaster, San Francisco. Business mail may still be addressed to Box 1528, Stanford University.

LOUIS H. WELTMAN is with the Lion Oil Refining Company, Tower Building, Jackson, Mississippi.

ROY D. MCANINCH, of the Stanolind Oil and Gas Company, Oklahoma City, has been elected vice-president of the Oklahoma City Geological Society, succeeding THEODORE G. GLASS, of the Sinclair Prairie Oil Company, who has been transferred by his company to become district geologist at Amarillo, Texas.

J. L. OLDS, of the Olds Drilling Company, has moved from San Francisco, California, to Stanford, Kentucky.

J. J. DOZY, recently at the Lensbury Club, Teddington, Middlesex, England, is with the Caribbean Petroleum Company, Caracas, Venezuela.

GEORGE F. BARNWELL, who has been in the employ of the New Zealand Petroleum Company, Gisborne, New Zealand, has changed his address to Popham Hall, Scarsdale, New York.

JOHN EDWARD BREWER, formerly of Wichita, Kansas, is with the Globe Oil Company, 811 Apco Tower, Oklahoma City, Oklahoma.

CARL W. HUBMAN, of Boulder, Colorado, is in China or elsewhere East. His address is APO 627, c/o Postmaster, New York, N. Y.

JAMES A. SMITH, of Pasadena, California, is party chief for a new United Geophysical Company seismograph crew in Colombia. His address is Apartado 465, Barranquilla, Colombia, S. A.

GARLAND O. GRIGSBY has returned from the army and has opened an office as consulting geologist in the Ricou-Brewster Building, Shreveport, Louisiana.

J. H. E. WARD is no longer associated with the Forest Development Corporation. He has been employed as district geologist in San Antonio by the Mid-Continent Petroleum Corporation since the first of the year.

E. G. DAHLGREN, with the Interstate Oil Compact Commission in Oklahoma City, Oklahoma, gave an illustrated lecture on "Underground Storage of Natural Gas," before the Shawnee Geological Society at a meeting held May 17, in the Aldridge Hotel, Shawnee.

FRANK A. MELTON, of the School of Geology, University of Oklahoma, lectured on "Aerial Photographs," at the meeting of the Tulsa Geological Society, May 21.

ALFRED K. TYSON, manager of the land department, southern division of the Continental Oil Company at Houston, has been elected an assistant secretary of the company.

JOHN W. BRICE, executive vice-president and director of the Carter Oil Company, Tulsa, has become assistant coordinator of producing activities of the Standard Oil Company (New Jersey).

CURTIS J. HESSE, curator of the museum of the Texas Agricultural and Mechanical College, College Station, Texas, died on May 12, at the age of 39 years, following a heart attack.

RALPH E. ESAREY, formerly State geologist of Indiana, is geologist for the Indiana Farm Bureau Oil Company, Evansville, Indiana.

RALPH HENDEE SMITH is with The Texas Company at Jackson, Mississippi.

Major JAMES L. LAKE, JR., formerly with Subterrex, Houston, Texas, is with the Burma Road Engineers. His address is APO 488, c/o Postmaster, New York.

GERALD JOHN LOETTERLE has left the Shell Oil Company, Inc. His present connection is the consulting firm of Hudnall and Pirtle, Tyler, Texas.

C. LYNN JACOBSEN, recently with the United States Geological Survey at Norman, Oklahoma, is with the Union Oil Company of California, at Laramie, Wyoming.

JOSEPH HORNBERGER, JR., consulting geologist, presented a paper on "Stratigraphic Study of Portions of Jackson and Wharton Counties, Texas," before the Houston Geological Society, May 17.

President MONROE G. CHENEY, of Coleman, Texas, spoke before the Houston Geological Society on May 17, the Fort Worth Geological Society on May 21, and the Dallas Petroleum Geologists on May 23. A fully attended meeting of the executive committee of the Association was held at Fort Worth on May 15 and 16.

JOHN L. RICH, consulting geologist and chairman of the department of geology and geography of the University of Cincinnati, is in China as a consultant to the China Natural Resources Commission on exploration and development of petroleum and natural gas resources.

R. A. RANK has left the Navarro Oil Company to become district geologist for the British American Oil Producing Company at Jackson, Mississippi.

The firm of DeGOLYER and MacNAUGHTON, consulting petroleum geologists of Dallas, Texas, has been retained by the Government of Brazil to serve in an advisory capacity to the National Petroleum Council in exploration and development.

BENO GUTENBERG, of the California Institute of Technology, Pasadena, JOHN B. REESIDE, JR., and WILLIAM W. RUBEX, of the United States Geological Survey, Washington, D. C., have been elected to the National Academy of Sciences.

Colonel HOWARD C. PYLE, formerly chief production engineer for the Union Oil Company, Los Angeles, California, has been chief assistant since October, 1944, in Petroleum, Oil, Lubricants for Supreme Headquarters of the A.E.F.

J. EARLE BROWN, consulting geologist and producer, Fort Worth, Texas, is a director and vice-president of the South Shore Oil and Development Company of Chicago.

FREDERIC A. BUSH, chief geologist of the Sinclair Prairie Oil Company, has moved from Tulsa to the principal offices in New York City. Bush has been with the company 19 years.

ARTHUR WADE, who is geological officer with the Allied Geographical Section, South West Pacific Area, Box 639 J, G.P.O., Brisbane, Australia, has been engaged in national broadcasting: one recent talk was on "Service," and another on "Treasures."

JOSEPH A. SHARPE has resigned as chief physicist of the Stanolind Oil and Gas Company in order to become vice-president of C. H. Frost Gravimetric Surveys, Inc., of Tulsa, Oklahoma.

GLENN SCOTT DILLÉ, manager of the land and geological department of the Deep Rock Oil Corporation, Tulsa, has been elected a vice-president of the company.

The Shreveport Geological Society listened to W. J. GILLINGHAM, of the Schlumberger Well Surveying Corporation, May 14, on the subject, "An Interpretation of Electrical Logs in North Louisiana and Mississippi."

J. M. NISBET, who recently resigned as vice-president and director of the Cities Service Oil Company, Bartlesville, Oklahoma, has returned to his citrus ranch at 300 West 22d Street, Upland, California.

EZEQUIEL ORDOÑEZ, of Mexico City, is the author of a new book on the recent volcano, Parícutin, *El Volcán de Parícutin*, published in 1945 by the Comisión Impulsora y Coordinadora de la Investigación Científica de México. It contains 138 pages, 56 photographs, and 2 sketch maps. It is in Spanish.

Newly elected officers of the Tulsa Geological Society are: president, A. N. MURRAY, University of Tulsa; first vice-president, PAUL E. FITZGERALD, Dowell, Inc., Kennedy Building; second vice-president, OSCAR HATCHER, Helmerich & Payne, Inc., 415 Phil-tower Building; secretary-treasurer, GLENN R. V. GRIFFITH, U. S. Geological Survey, Box 311; editor, CHARLES J. DEEGAN, Oil and Gas Journal, Box 1260. New members of the council are: A. L. ACKERS, Stanolind Oil and Gas Company, Tulsa; CASTLE J. C. HARVEY, Atlantic Refining Company, Tulsa; and T. E. WEIRICH, Phillips Petroleum Company, Bartlesville.

The Illinois Geological Society has elected new officers: president, LEE C. LAMAR, Carter Oil Company, Mattoon; vice-president, JACK HIRSCH, Texas Company, Mattoon; secretary-treasurer, GENE GADDESS, Pure Oil Company, Olney.

JOHN L. HENNING of Lake Charles, Louisiana, formerly president and manager of the Union Sulphur Company, died on May 23, at the age of 66 years.

CHARLES T. KIRK died at Tulsa, Oklahoma, June 1, at the age of 68 years. Since graduating from the University of Oklahoma in 1904, he was successively a teacher, a member of State and the United States geological surveys, a college professor, State geologist of New Mexico, and since 1918 engaged in consulting work in many states. He was one of the original members of the A.A.P.G. in 1917.

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 799 Subway Terminal Building
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 LOS ANGELES, CALIFORNIA
 Vandike 7087

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Core Drilling Contractor
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 W Hiney 9876

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 130 East Fifth Avenue
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HARRY W. OBORNE
Geologist
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 Main 7525 Murray Hill 9-3541

ILLINOIS

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T. E. WALL
Geologist
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M I S S I S S I P P I			
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<p>JOSEPH A. SHARPE <i>Geophysicist</i> C. H. FROST GRAVIMETRIC SURVEYS, INC. 1242 South Boston Ave. Tulsa 3, Okla.</p>	<p>C. L. WAGNER <i>Consulting Geologist Petroleum Engineering Geophysical Surveys</i> 2259 South Troost Street TULSA OKLAHOMA</p>
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<p>G. H. WESTBY <i>Geologist and Geophysicist</i> <i>Seismograph Service Corporation</i> Kennedy Building Tulsa, Oklahoma</p>	<p>HUNTLEY & HUNTLEY <i>Petroleum Geologists and Engineers</i> L. G. HUNTLEY J. R. WYLLIE, JR. JAMES F. SWAIN Grant Building, Pittsburgh, Pa.</p>
TEXAS	
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<p>FORAN, BOATRIGHT & DIXON <i>Consulting Petroleum and Natural Gas Engineers and Geologists</i> B. B. Boatright, P. C. Dixon, R. B. Mitchell Second National Bank Building Houston 2, Texas Capitol 7319</p>	
<p>D'ARCY M. CASHIN <i>Geologist Engineer</i> <i>Specialist Gulf Coast Salt Domes</i> Examinations, Reports, Appraisals Estimates of Reserves 705 Nat'l Standard Bldg. HOUSTON, TEXAS</p>	<p>CUMMINS, BERGER & PISHNY <i>Consulting Engineers & Geologists</i> Specializing in Valuations 1603 Commercial Standard Bldg. Fort Worth 2, Texas Ralph H. Cummins Walter R. Berger Chas. H. Pishny</p>
<p>E. DeGOLYER <i>Geologist</i> Esperson Building Houston, Texas Continental Building Dallas, Texas</p>	<p>J. H. DEMING <i>Geophysicist</i> KEYSTONE EXPLORATION COMPANY 2813 Westheimer Road Houston, Texas</p>

<p>ALEXANDER DEUSSEN <i>Consulting Geologist</i> Specialist, Gulf Coast Salt Domes 1006 Shell Building HOUSTON, TEXAS</p>	<p>DAVID DONOGHUE <i>Consulting Geologist</i> <i>Appraisals - Evidence - Statistics</i> Fort Worth National Bank Building FORT WORTH, TEXAS</p>
<p>J. E. (BRICK) ELLIOTT <i>Petroleum Engineer</i> 108 West 15th Street Austin, Texas</p>	<p>F. B. Porter R. H. Fash <i>President Vice-President</i> THE FORT WORTH LABORATORIES Analyses of Brines, Gas, Minerals, Oil, Interpretation of Water Analyses. Field Gas Testing. 828½ Monroe Street FORT WORTH, TEXAS Long Distance 138</p>
<p>JOHN A. GILLIN <i>National Geophysical Company</i> Tower Petroleum Building Dallas, Texas</p>	<p>W. G. SAVILLE J. P. SCHUMACHER A. C. PAGAN GRAVITY METER EXPLORATION CO. TORSION BALANCE EXPLORATION CO. <i>Gravity Surveys</i> <i>Domestic and Foreign</i> 1347-48 ESPERSON BLDG. HOUSTON, TEX.</p>
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<p>L. B. HERRING <i>Geologist</i> Natural Gas Petroleum DRISCOLL BLDG. CORPUS CHRISTI, TEXAS</p>	<p>JOHN M. HILLS <i>Consulting Geologist</i> Midland, Texas Box 418 Phone 1015</p>
<p>PALEONTOLOGICAL LABORATORY R. V. HOLLINGSWORTH <i>Geologist</i> Box 51 Phone 2359 MIDLAND, TEXAS</p>	<p>J. S. HUDNALL G. W. PIRTLE HUDNALL & PIRTLE <i>Petroleum Geologists</i> <i>Appraisals Reports</i> Peoples Nat'l. Bank Bldg. TYLER, TEXAS</p>
<p>JOHN S. IVY <i>Geologist</i> 1124 Niels Esperson Bldg., HOUSTON, TEXAS</p>	<p>W. P. JENNY <i>Consulting Geologist and Geophysicist</i> Specializing in MICROMAGNETIC SURVEYS, GEOLOGICAL INTERPRETATIONS and CORRELATIONS of seismic, gravimetric, electric and magnetic surveys. 1404 Esperson Bldg. HOUSTON, TEXAS</p>

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GEOLOGICAL AND GEOPHYSICAL SOCIETIES

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Petroleum Administration for War
First National Bank Building
1st Vice-President John Vanderwilt
Climax Molybdenum Company
2nd Vice-President Max L. Krueger
Union Oil Company of California
Secretary-Treasurer Robert McMillan
Frontier Refining Company
First National Bank Building
Luncheons every Friday noon, Cosmopolitan Hotel.
Evening dinner (6:15) and program (7:30) first
Monday each month or by announcement, Cosmo-
politan Hotel.

INDIANA KENTUCKY

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Vice-President Hillard W. Bodkin
The Superior Oil Company
Secretary-Treasurer Jess H. Hengst
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Meetings will be announced.

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Humble Oil and Refining Company
1405 Canal Bldg.
Vice-President and Program Chm. B. E. Brumer
The Texas Company, P.O. Box 252
Secretary-Treasurer R. R. Copeland, Jr.
The California Company, 1818 Canal Bldg.

Meets the first Monday of every month, October-
May inclusive, 7:30 P.M., St. Charles Hotel.
Special meetings by announcement. Visiting geol-
ogists cordially invited.

LOUISIANA

SOUTH LOUISIANA GEOLOGICAL SOCIETY LAKE CHARLES, LOUISIANA

President Max Bornhauser
Continental Oil Co., Box 569, Lafayette
Vice-President A. Lyndon Morrow
Magnolia Petroleum Co., Box 872
Secretary Bruce M. Choate
Atlantic Refg. Co., Box 895
Treasurer P. F. Haberstick

Meetings: Dinner and business meetings third
Tuesday of each month at 7:00 P.M. at the Majestic
Hotel. Special meetings by announcement. Visiting
geologists are welcome.

ILLINOIS

ILLINOIS GEOLOGICAL SOCIETY

President Lee C. Lamar
Carter Oil Company, Box 568, Mattoon
Vice-President Jack Hirsch
The Texas Company, Mattoon
Secretary-Treasurer Gene Gaddess
Pure Oil Company, Olney
Meetings will be announced.

KANSAS

KANSAS GEOLOGICAL SOCIETY WICHITA, KANSAS

President Virgil B. Cole
Gulf Oil Corporation
Vice-President Laurence C. Hay
Consulting Geologist, 402 Union National
Bank Building
Secretary-Treasurer Edward A. Huffman
J. M. Huber Corporation, 407 First National
Bank Building
Regular Meetings: 7:30 P.M., Geological Room,
University of Wichita, first Tuesday of each month.
The Society sponsors the Kansas Well Log Bureau,
412 Union National Bank Building, and the Kan-
sas Well Sample Bureau, 137 North Topeka.

LOUISIANA

THE SHREVEPORT GEOLOGICAL SOCIETY SHREVEPORT, LOUISIANA

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Vice-President E. P. Ogier
c/o W. C. Spooner, Box 1195, Zone 90
Secretary-Treasurer L. H. Meltzer
Union Producing Co., Box 1407, Zone 92

Meets the first Monday of every month, September
to May, inclusive, 7:30 P.M., Criminal Court
Room, Caddo Parish Court House. Special meetings
and dinner meetings by announcement.

MICHIGAN

MICHIGAN GEOLOGICAL SOCIETY

President Kenneth K. Landes
University of Michigan, Ann Arbor
Vice-President T. J. Weaver
Michigan Consolidated Gas Co., Grand Rapids
Secretary-Treasurer Manley Osgood, Jr.
Cities Service Oil Co., Box 149, Mt. Pleasant
Business Manager Harry J. Hardenberg
Michigan Geological Survey,
Capitol Savings and Loan Bldg., Lansing

Meetings: Bi-monthly from November to April at
Lansing. Afternoon session at 3:00, informal din-
ner at 6:30 followed by discussions. (Dual meetings
for the duration.) Visiting geologists are welcome.

MISSISSIPPI	OKLAHOMA
<p align="center">MISSISSIPPI GEOLOGICAL SOCIETY JACKSON, MISSISSIPPI</p> <p><i>President</i> L. R. McFarland Magnolia Petroleum Company Box 3671, West Jackson</p> <p><i>Vice-President</i> J. B. Storey Union Producing Company</p> <p><i>Secretary-Treasurer</i> Frederic F. Mellen Mellen & Monsour Box 2571, W. Jackson Sta.</p> <p>Meetings: First and third Thursdays of each month, from October to May, inclusive, at 7:30 P.M., Edwards Hotel, Jackson, Mississippi. Visiting geologists welcome to all meetings.</p>	<p align="center">ARDMORE GEOLOGICAL SOCIETY ARDMORE, OKLAHOMA</p> <p><i>President</i> Stanford L. Rose The California Company, 618 Simpson Bldg.</p> <p><i>Vice-President</i> Maynard P. White Gulf Oil Corporation, Box 30</p> <p><i>Secretary-Treasurer</i> Hamilton M. Johnson Schlumberger Well Sureying Corp., Box 747</p> <p>Dinner meetings will be held at 7:00 P.M. on the first Wednesday of every month from October to May, inclusive, at the Ardmore Hotel.</p>
OKLAHOMA	
<p align="center">OKLAHOMA CITY GEOLOGICAL SOCIETY OKLAHOMA CITY, OKLAHOMA</p> <p><i>President</i> Ralph L. Fillmore Anderson-Prichard Oil Co., 1000 Apco Tower</p> <p><i>Vice-President</i> Roy D. McAninch Stanolind Oil and Gas Company Box 1633</p> <p><i>Secretary-Treasurer</i> Carl A. Moore Carter Oil Company 1300 Apco Tower</p> <p>Meetings: Technical program each month, subject to call by Program Committee, Oklahoma City University, 24th Street and Blackwelder. Lunches: Every second Thursday, at 12:00 noon, Skirvin Hotel.</p>	<p align="center">SHAWNEE GEOLOGICAL SOCIETY SHAWNEE, OKLAHOMA</p> <p><i>President</i> Allen Ehlers</p> <p><i>Vice-President</i> John P. Lukens Oklahoma Seismograph, 1103 North Philadelphia</p> <p><i>Secretary-Treasurer</i> Marcelle Mousley Atlantic Refining Company, Box 169</p> <p>Meets the fourth Thursday of each month at 8:00 P.M., at the Aldridge Hotel. Visiting geologists welcome.</p>
	<p align="center">TULSA GEOLOGICAL SOCIETY TULSA, OKLAHOMA</p> <p><i>President</i> A. N. Murray University of Tulsa</p> <p><i>1st Vice-President</i> Paul E. Fitzgerald Dowell, Inc., Kennedy Building</p> <p><i>2nd Vice-President</i> Oscar Hatcher Helmerich & Payne, Inc., 415 Philtower</p> <p><i>Secretary-Treasurer</i> Glenn R. V. Griffith U. S. Geological Survey, Box 311</p> <p><i>Editor</i> Charles J. Deegan Oil and Gas Journal, Box 1260</p> <p>Meetings: First and third Mondays, each month, from October to May, inclusive, at 8:00 P.M., University of Tulsa, Kendall Hall Auditorium. Lunches: Every Tuesday (October-May), Bradford Hotel.</p>
TEXAS	
<p align="center">CORPUS CHRISTI GEOLOGICAL SOCIETY CORPUS CHRISTI, TEXAS</p> <p><i>President</i> Ira H. Stein Bridwell Oil Company, Alice, Texas</p> <p><i>Vice-President</i> Henry D. McCallum Humble Oil and Refining Company</p> <p><i>Secretary-Treasurer</i> Elsie B. Chalupnik Barnsdall Oil Company, 604 Driscoll Building</p> <p>Regular luncheons, every Wednesday, Petroleum Room, Plaza Hotel, 12:05 P.M. Special night meetings, by announcement.</p>	<p align="center">DALLAS PETROLEUM GEOLOGISTS DALLAS, TEXAS</p> <p><i>President</i> Henry C. Cortes Magnolia Petroleum Company</p> <p><i>Vice-President</i> Cecil H. Green Geophysical Service, Inc.</p> <p><i>Secretary-Treasurer</i> Willis G. Meyer DeGolyer and MacNaughton, Continental Building</p> <p><i>Executive Committee</i> Henry J. Morgan Atlantic Refining Company</p> <p>Meetings: Monthly luncheons by announcement. Special night meetings by announcement.</p>

TEXAS

EAST TEXAS GEOLOGICAL
SOCIETY
TYLER, TEXAS

President - - - - - J. H. McGuirt
Vice-President - - - - - R. M. Trowbridge
 Trowbridge Sample Service

Secretary-Treasurer - - - - - G. T. Buskirk
 Stanolind Oil and Gas Company, Box 660

Meetings: Regular meetings at 7:30 P.M., the second Monday, each month, City Hall.
 Luncheons: Noon, fourth Monday, each month, Blackstone Hotel.

HOUSTON
GEOLOGICAL SOCIETY
HOUSTON, TEXAS

President - - - - - W. B. Milton, Jr.
 Houston Oil Co. of Texas, Box 2412
Vice-President - - - - - W. B. Moore
 Atlantic Refining Company, Box 1346

Secretary - - - - - Charles H. Sample
 J. M. Huber Corporation, 721 Bankers
 Mortgage Building

Treasurer - - - - - Homer A. Noble
 Magnolia Petroleum Company, Box 111

Regular meeting held the first and third Thursdays at noon (12 o'clock), Mezzanine floor, Texas State Hotel. For any particulars pertaining to the meetings write or call the secretary.

SOUTH TEXAS GEOLOGICAL
SOCIETY

SAN ANTONIO, TEXAS

President - - - - - Harvey Whitaker
 1409 Milam Building

Vice-President - - - - - George H. Coates
 638 Milam Building

Secretary-Treasurer - - - - - Marion J. Moore
 Transwestern Oil Company, 1600 Milam Building

Meetings: One regular meeting each month in San Antonio. Luncheon every Monday noon at Milam Cafeteria, San Antonio.

WEST VIRGINIA

THE APPALACHIAN GEOLOGICAL
SOCIETYCHARLESTON, WEST VIRGINIA
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President - - - - - Douglas Rogers, Jr.
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Vice-President - - - - - Veclair C. Smith
 Kanawha Valley Bank Building

Secretary-Treasurer - - - - - W. B. Maxwell
 United Fuel Gas Company, Box 1273

Editor - - - - - H. J. Simmons, Jr.
 Godfrey L. Cabot, Inc., Box 1473

Meetings: Second Monday, each month, except June, July, and August, at 6:30 P.M., Kanawha Hotel.

FORT WORTH
GEOLOGICAL SOCIETY
FORT WORTH, TEXAS

President - - - - - Thomas B. Romine
 Sinclair Prairie Oil Company, 901 Fair Building

Vice-President - - - - - William J. Nolte
 Stanolind Oil and Gas Company, Box 1410

Secretary-Treasurer - - - - - Spencer R. Normand
 Independent Exploration Company
 2210 Ft. Worth Natl. Bank Bldg.

Meetings: Luncheon at noon, Hotel Texas, first and third Mondays of each month. Visiting geologists and friends are invited and welcome at all meetings.

NORTH TEXAS
GEOLOGICAL SOCIETY

WICHITA FALLS, TEXAS

President - - - - - William Lloyd Haseltine
 Magnolia Petroleum Co., Box 239

Vice-President - - - - - Charles R. Canfield
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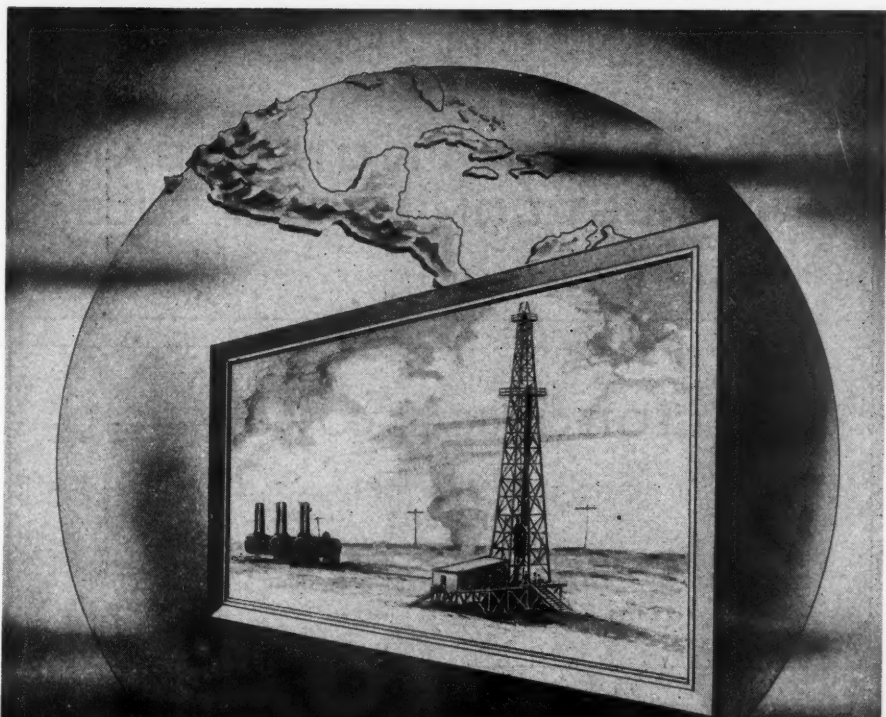
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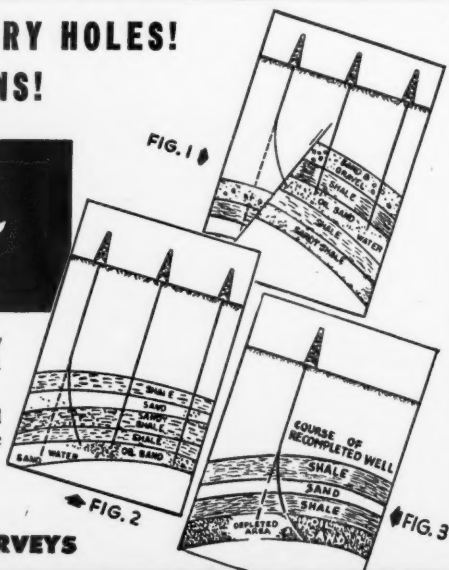
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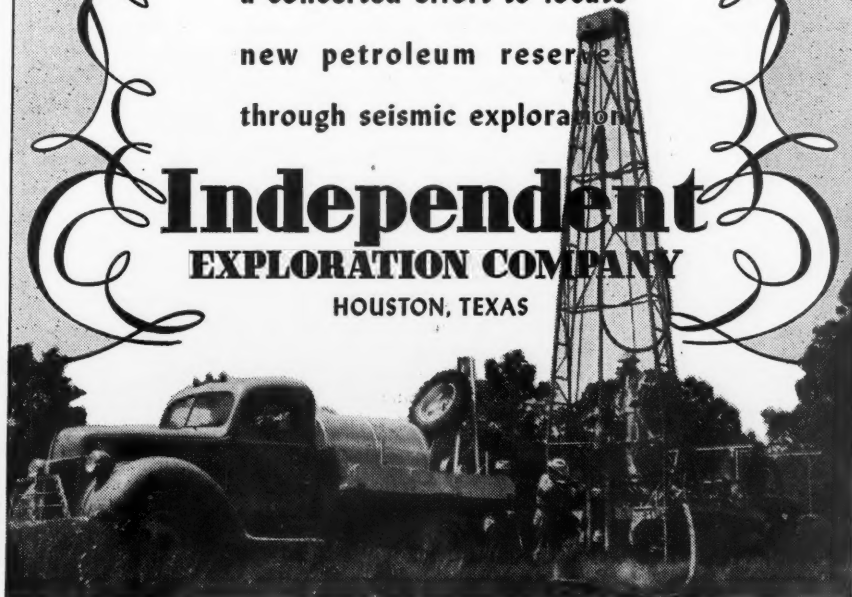
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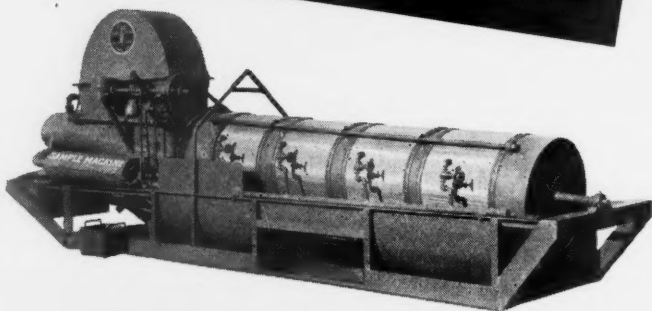
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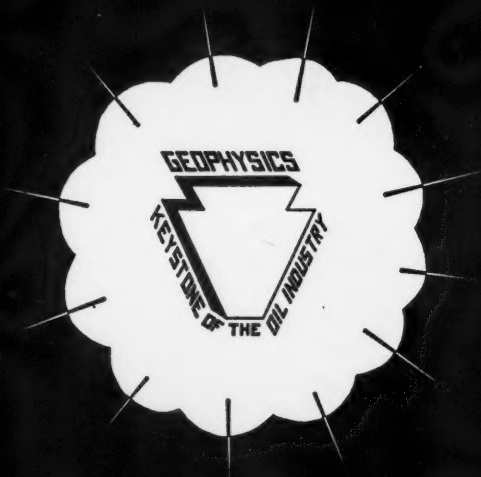
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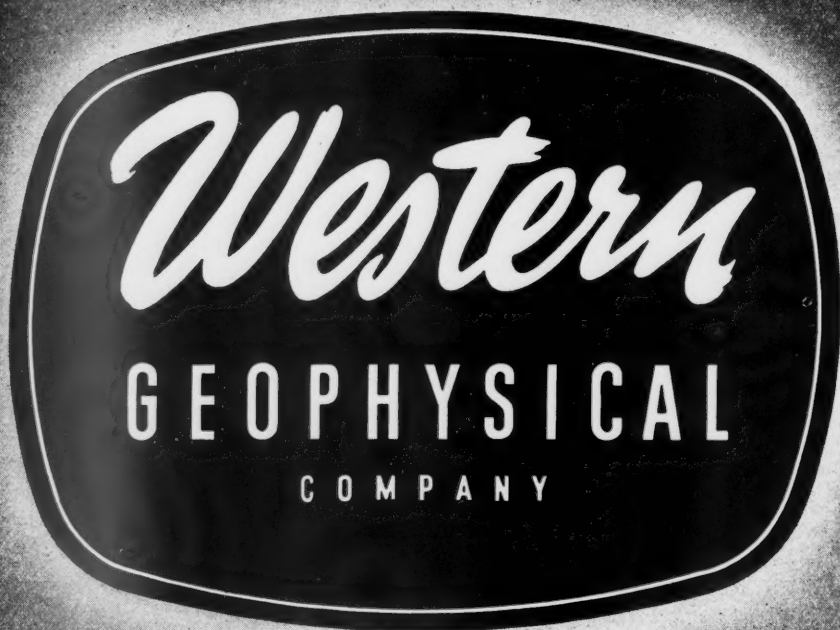
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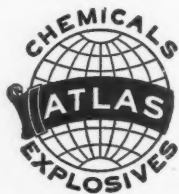
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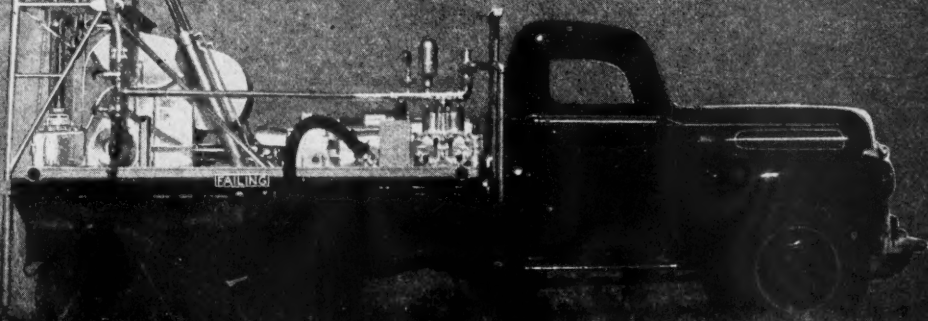
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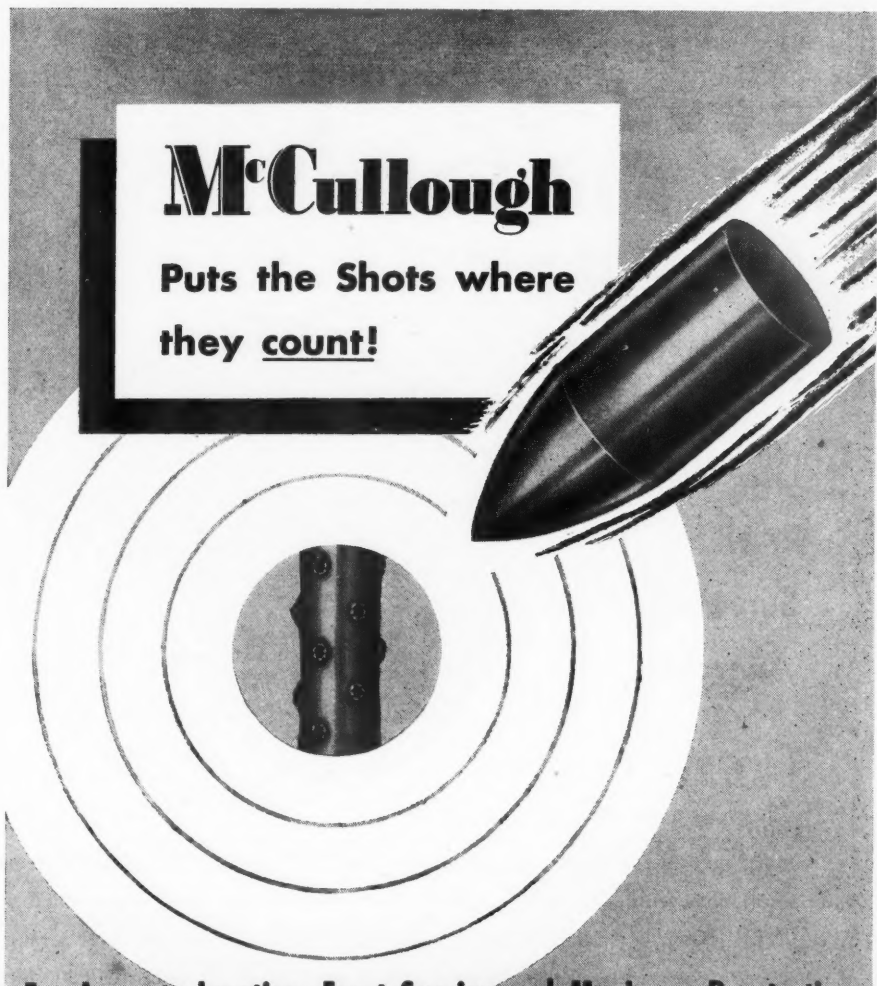
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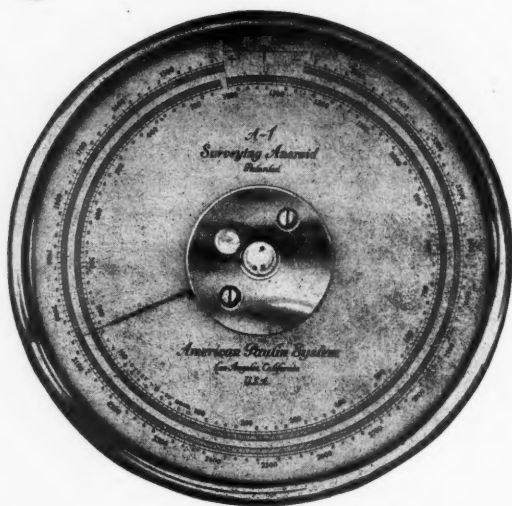
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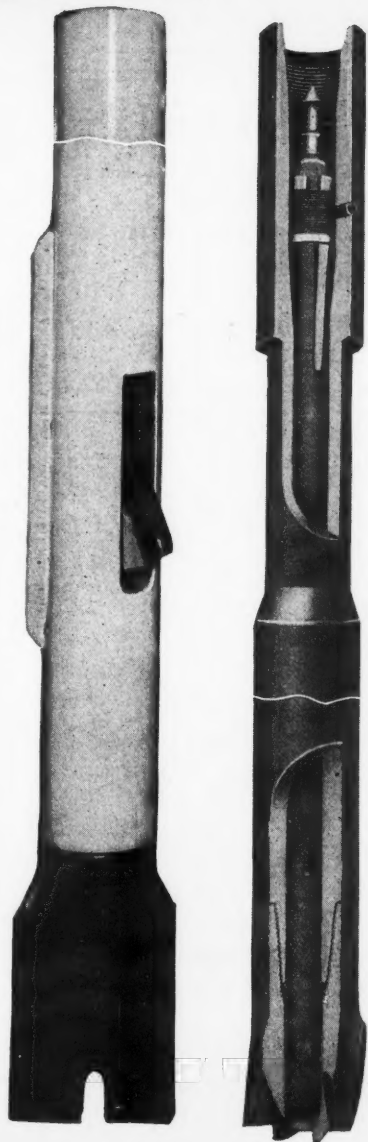
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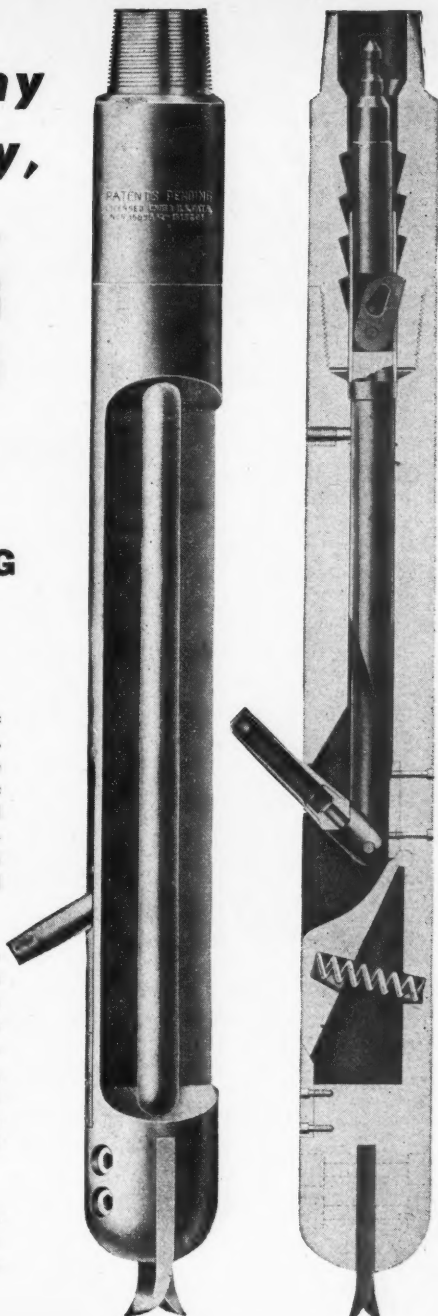



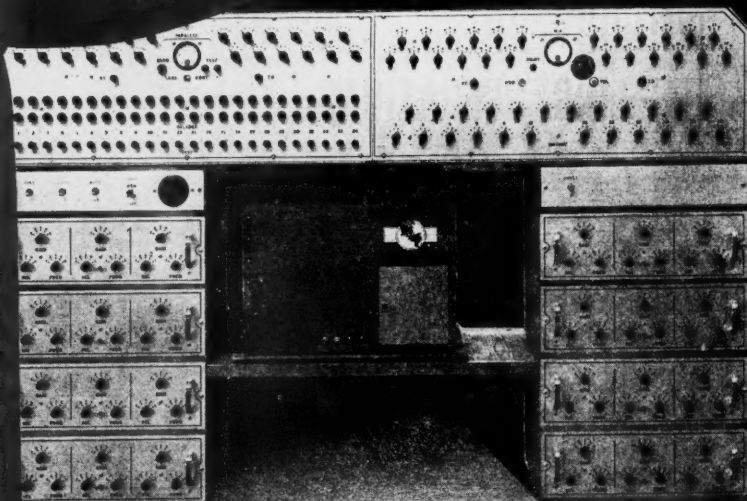
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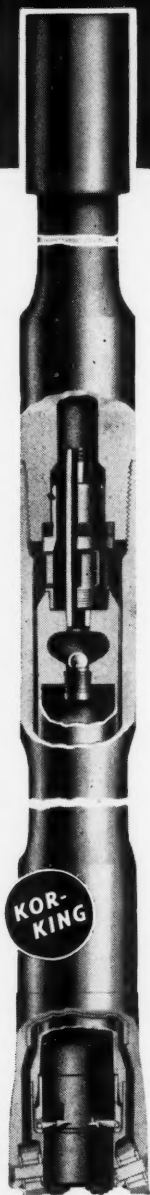
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